

**No. 706,842.**

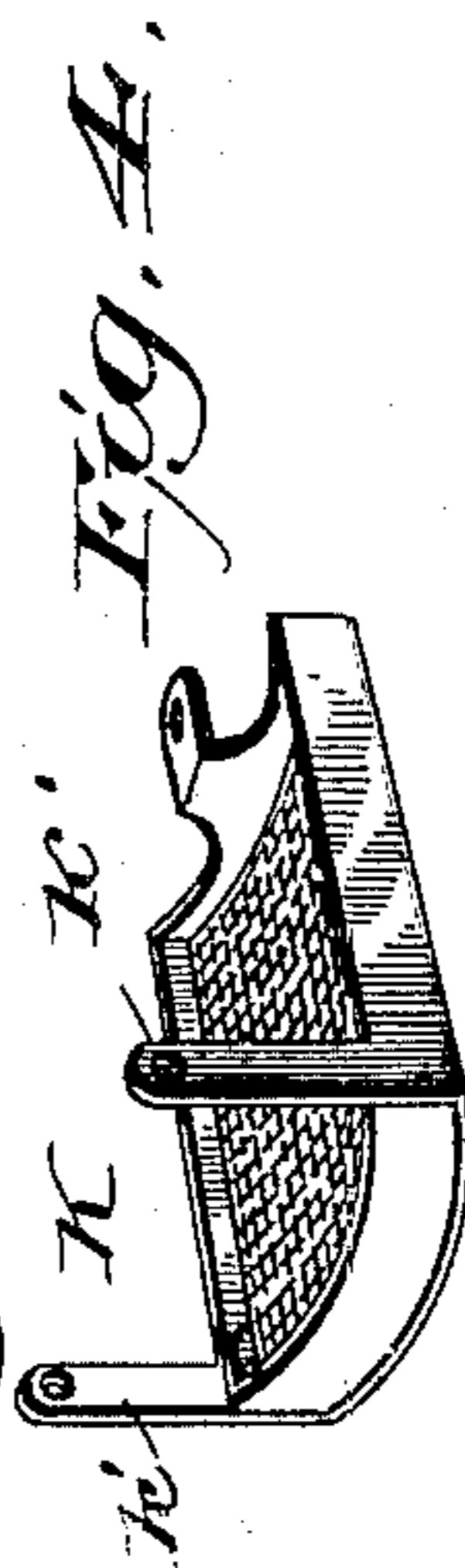
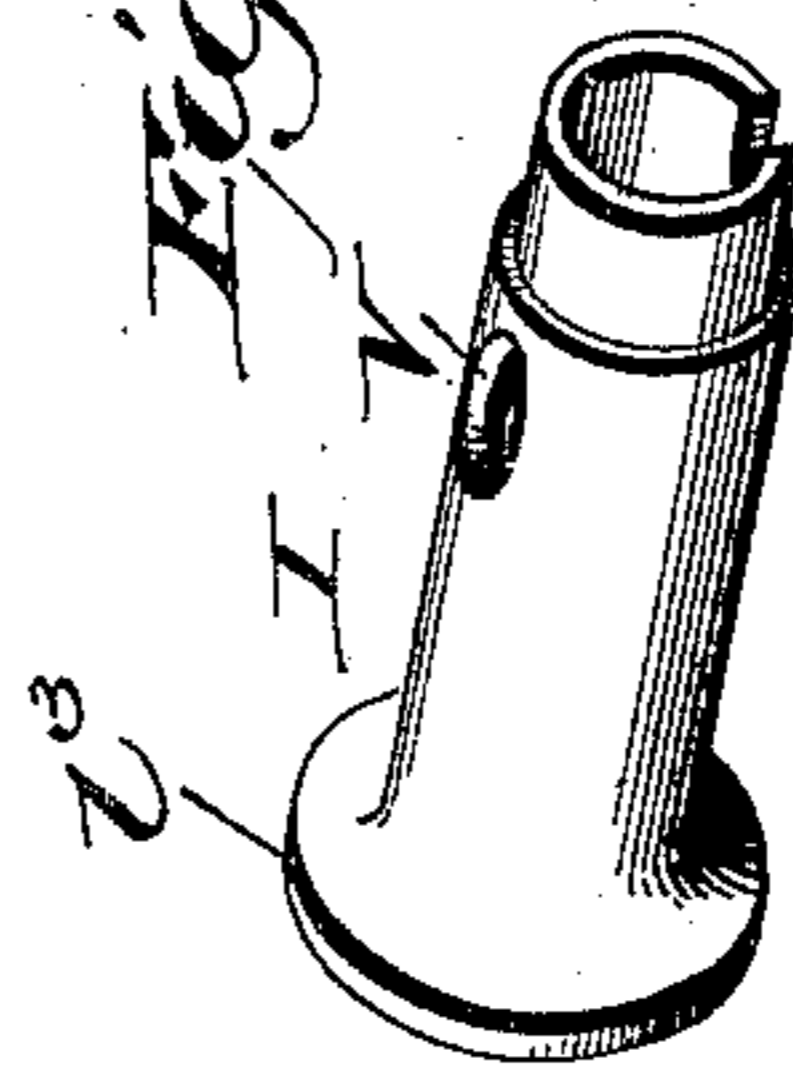
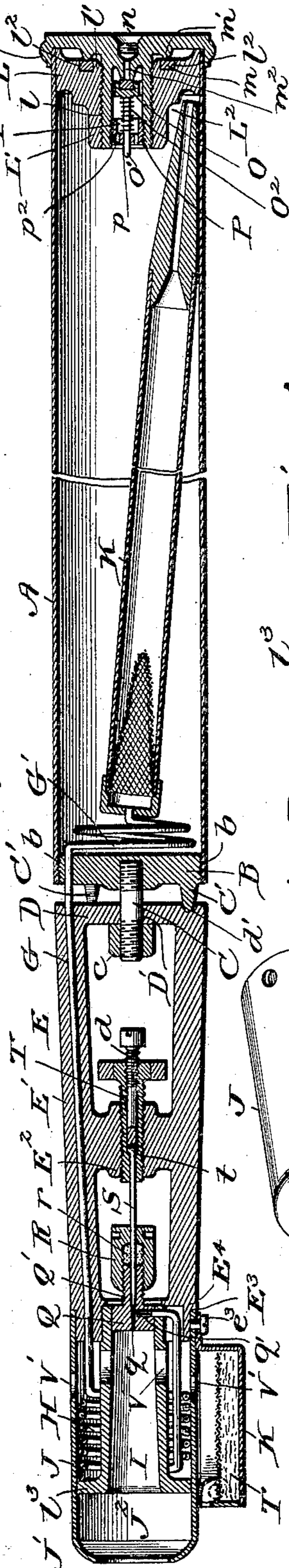
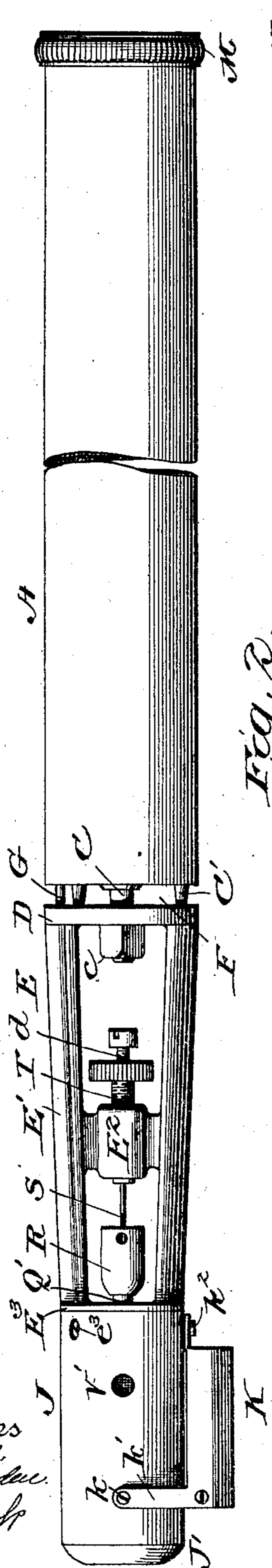
Patented Aug. 12, 1902.

**W. MITCHELL.**

**VAPOR BURNING TORCH.**

(Application filed Feb. 14, 1901. Renewed June 5, 1902.)

(No Model.)



Witnesses  
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# UNITED STATES PATENT OFFICE.

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## VAPOR-BURNING TORCH.

SPECIFICATION forming part of Letters Patent No. 706,842, dated August 12, 1902.

Application filed February 14, 1901. Renewed June 5, 1902. Serial No. 110,327. (No model.)

*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 Vapor-Burning Torches and like Implements; 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 vapor-burning torches; and it consists in the construction and combination of parts hereinafter particularly set forth and claimed.

In the accompanying drawings, Figure 1 represents a side elevation of an improved torch embodying my invention. Fig. 2 represents a longitudinal central section of the same. Fig. 3 represents a detail perspective view of the burner-casing. Fig. 4 represents a detail perspective view of the alcohol-tray, and Fig. 5 represents a detail perspective view of the mixing-chamber.

A designates the cylindrical handle of the torch and is hollow, constituting also the main liquid-reservoir therefor. The front-end of the handle or reservoir is a disk B, provided with external screw-threads *b*, which turn into corresponding interior threads in the front end of the handle-body. This disk or end piece B is attached rigidly by a central screw-threaded stud C and a nut *c* to a similar but thinner disk D, forming part of the body or frame E of the torch. The said stud is formed with the said disk B or rigidly attached thereto and extends through a central opening D' in the disk D. A series of lugs C' are formed on the forward face of the disk or end piece B. Their forward ends, which are preferably tapered, fit into small recesses *d'* in the proximate face of the disk D. These lugs or studs C' keep the two disks apart, forming a space F, through which air may pass freely, and thereby protecting the liquid in the reservoir from being overheated. They also prevent the said disks from turning with respect to each other, which of course would tend to separate the parts of the tool and would bring

undue strain on the gasoline-tube, which passes through them both, thereby probably breaking the same. G designates the said tube, which passes up through a hollow longitudinal bar E' of the frame or body E to the generator H, the latter consisting of a helical coil of fine tubular wire wound between a cylindrical mixing-chamber I and an exterior burner-casing J of similar form arranged concentrically with regard to said mixing-chamber. The receiving end of the said tube G is wound to form the coil-spring G', arranged within the forward end of the reservoir A and in a plane parallel to the disk or end piece B, the inner end of the said coil being attached to the forward end of a cigar-shaped inner reservoir K, the tapering rear end of the said reservoir inclining by gravity down to the wall of the said outer reservoir near the rear end of the latter in whatever position the tool may be held, excepting a vertically-upward one. A cylindrical inward offset L' of a disk L, which is soldered into the outer end of the said handle, forming the outer end piece thereof, serves to prevent the said inner reservoir from rattling about the interior of the said outer reservoir and from bringing undue strain upon its resilient wire support G' when the position of the tool is shifted in use. This is effected by the contact of the said offset with the tip or tapering end of the said inner reservoir, the said offset being centrally arranged and leaving an annular space L<sup>2</sup>, in which the said tip slides around in a circular path, the said offset serving as a guide therefor. No matter what the position of the torch, the said inner reservoir will take up the oil, however low the supply may run, until nearly the last drop. The attachment of the said inner reservoir to the disk at the front end of the outer reservoir A enables me to use a very short length of pipe within the latter, and the detachability of the said end piece or disk B from handle and its rigid attachment to the body or frame E allows the outer reservoir to be removed without severing the connections of the gasoline-tube or disturbing any other parts of the tool. It also allows the inner reservoir to be removed

with the said body and the other parts attached thereto for convenience of inspection, cleansing, and repair. The said disk or outer end piece L has a central opening  $l$ , which  
 5 extends through the offset  $L'$  and also through a corresponding but shorter one  $l'$  in the outer face of the said disk, as illustrated in Fig. 2. This latter offset is formed by a shallow annular groove  $l^2$ , which receives a packing-  
 10 ring  $m$ . The wall of the said opening is screw-threaded for a part of its length to receive the externally screw-threaded stem  $M'$  of a milled cap M, which overlaps peripherally the outer end of the handle-body and is  
 15 provided on its inner face with an annular flange  $m'$ , adapted to bite into said packing-ring and prevent leaking. The said stem is tubular, but with a valve-seat  $m^2$  near its forward end, leaving only a small central aper-  
 20 ture and dividing its bore into an inner part of larger diameter and an outer part of less diameter, each of which is provided with screw-threads. The outer part of said bore receives a screw-plug  $n$  while in use. When  
 25 it is to be supplied with air-pressure for starting the flow of liquid, this plug is removed and a suitable coupling is substituted, permitting any ordinary bulb, pump, or other air-forcing device to perform its function.  
 30 In the inner part of the said bore a valve O, having a stem  $O'$ , is held against the said seat, so as to close the said aperture by the pressure of a helical spring  $O^2$ . A block P screws into the inner end of the said stem  $m$   
 35 and holds the said spring and valve within the latter, but has a central hole  $p$  to allow the rearward sliding of the said valve-stem when the said spring yields under the pressure of the air. The said block constitutes a  
 40 small inner cap for the said bore, being provided with a deep recess  $P'$  to afford greater space for the said spring. It has also two air-outlet holes  $p^2$ , arranged on each side of the central hole for said valve-stem or other-  
 45 wise, as may be convenient. When the air forces back the valve from its seat, it flows around said valve and into the main reservoir A through the said holes  $p^2$ , applying the desired pressure to the gasolene or other liq-  
 50 uid. When the reservoir is to be filled, the cap M is screwed out and the liquid is poured in through the opening  $l$ , said cap being afterward replaced. This is, of course, the first step in preparing the tool for service, the sup-  
 55 ply of compressed air being next in order. The generator is next heated by igniting a little alcohol in proximity thereto or in any other convenient manner, and after it is sufficiently heated to vaporize the gasolene or  
 60 equivalent material in greater quantity than the burner will consume the excess of gas or vapor will pass back through the gasolene-tube G into the main reservoir A, making the apparatus automatic without need of further  
 65 air-supply or other extraneous means to force the liquid to the generator.

The action above described producing con-

tinuously and reliably an excess of gas or vapor beyond the capacity of a burner to consume requires, of course, an intense heat 70 and a careful adaptation of the sizes and forms of the various parts of the tool to each other. Several different constructions of generators and burners may be used with the devices hereinbefore described for effecting 75 this result. For example, I may use the devices set forth in my application for patent on vapor-burning lamps, No. 17,056; but I prefer in this instance the generator shown, having a continuous coil supplied through 80 one end only.

The devices hereinbefore set forth pertaining to the reservoirs and proximate parts may obviously be used with other tools of a nature more or less similar to gasolene-torches. 85

The mixing-chamber I is closed at its rear end by a jet-block Q, having a screw-threaded tubular stem  $Q'$ , which receives a packing-box R, containing packing  $r$ , said box and stem being bored in alinement with the jet-hole  $q$  90 in the center of said jet-block. A needle-valve S, operated by an adjusting-screw T, works through the said packing-box and jet-block to open and close the said jet-hole. The said screw engages an internally-thread- 95 ed fixed tubular part or nut  $E^2$  of the frame or body of the torch, and it is centrally bored longitudinally of the frame to receive a part of the said valve. The latter has a spherical head which fits against a seat in a recess  $t$ , 100 formed in the head of the said screw, the wall of the said recess being screw-threaded to receive a screw  $d$ , which holds the said valve detachably in place. The said jet-block is provided with a lateral passage  $q'$ , which 105 communicates with the central bore of said block near the jet-hole and receives the discharge end of the generator-coil. The mixing-chamber I is provided with air-holes V near the said jet-block, the latter being imper- 110 forate except for the central jet-hole already mentioned. These air-holes register with smaller holes  $V'$  in the outer casing J. The air is therefor admitted to the said chamber at the sides thereof instead of at the rear end 115 and mixes with the vapor as the latter enters said chamber and is ignited, thus supporting combustion. The forward end of said chamber is provided with an annular offset or collar  $l^3$  in one piece with it, the same serving 120 to keep the generator in place and also as a brace for the exterior casing J. The latter fits upon a fixed collar  $E^4$ , integral with the body or frame E, and bears at its rear edge against a flange  $E^3$  of said frame. Screws  $e^3$  125 fasten the said casing to the said collar  $E^4$ . The latter is of equal diameter with the offset or collar  $l^3$ . The casing and mixing-chamber together constitute the burner. The said chamber increases regularly in diameter from 130 its inner to its outer end. This construction combines with the reduced discharge end of the casing J and the intervening space  $J^3$  to make an intense blaze, which may be applied

to burning off paint, melting fusible materials, and other industrial purposes.

I do not confine myself to the form of the generator shown, as there are divers other forms which may be satisfactorily employed instead and which are already well known in the art. The one herein shown has, however, the merit of simplicity and is easily and cheaply constructed, requiring little material. If the total length of the generator-tube or mixing-chamber be thirty-seven inches, the length of the generator-coil should be twenty-five inches and the taper of the mixing-chamber in its internal diameter should be from one-half inch at its inner end to nine-sixteenths of an inch at its outer end.

In the dimensions above stated for the coiled tubular generator H, I do not include the tube C integral therewith, which extends back to the reservoir. This tube and the said generator are made of tubular wire having, preferably, an external diameter of about one-sixteenth of an inch and an internal diameter of about one thirty-second of an inch. I do not wish, however, to be understood as confining myself closely to any of the dimensions above given, as they may be considerably varied without making the torch inoperative or unsatisfactory.

In starting the torch it is desirable to have some convenient appurtenance for applying heat temporarily to the burner. I therefore append to casing J an alcohol-tray K<sup>x</sup>, fastened thereto by screws *k*, which pass through vertical arms K', arranged one at each side of the forward end of the said tray and fitting against opposite sides of the forward part of the said casing, which is screw-tapped to receive them; also, by a screw *k*<sup>2</sup>, passing through a horizontal rearward lug or flange of the said tray similarly into the said casing, which is screw-tapped near its rear end to receive it on a longitudinal line midway between the similar lines passing through the screws aforesaid, this intermediate line being normally the bottom longitudinal line of the tool. Said tray is provided with a covering T, of asbestos-cloth or other refractory finely-woven mineral substance, which will allow the alcohol to be poured into it gradually, but prevent it from being suddenly splashed out by accident while the tool is in use. This cover is near the top of said tray and is concaved transversely corresponding to the curve of a cylinder of greater diameter than the casing J. The alcohol fumes are easily ignited above its woven-wire cover, space being left on all sides to admit air and the flames being allowed to act freely on the said casing and the generator within it. This alcohol-tray constitutes in effect a small alcohol-stove for temporary use and is blown out when the generator no longer needs it, being sufficiently heated by the flame within the mixing-chamber due to the combustion of the vaporized gasolene or other similar fuel. This tray is easily removable for purposes of

repair and cleansing and may be replaced with very little trouble if injured.

It is evident that the aforesaid devices, and particularly those hereinafter claimed, may be used in other tools of more or less similar general nature—for example, in soldering-irons. They are, however, primarily for use in torches for burning off paint and melting or softening metals.

Having thus described my invention, what I claim to be new, and wish to secure by Letters Patent, is—

1. In combination with a hollow tool-handle serving also as a reservoir for liquid fuel an inner supplemental reservoir flexibly suspended therein with its receiving end downward, the burner-generator and body of the tool removably attached to the said handle and a tubular connection between the said generator and the said inner reservoir, the latter being removable with the said body from the said handle or main reservoir substantially as set forth.

2. In combination with a tool-handle which also serves as a main reservoir for easily-vaporizable liquid fuel, the body of the said tool removably attached to the said handle, a generator and burner, an inner reservoir suspended flexibly within the main reservoir at the front thereof and arranged to have its receiving end always in position to draw out the liquid from the bottom of the said main reservoir except when the tool is held downward, and a tube extending from the generator to the said inner reservoir and serving also as the suspending device of the latter substantially as set forth.

3. In combination with the body of the tool-handle which also serves as the main reservoir for easily-vaporizable liquid fuel, a removable disk or inner end piece for said handle, an implement-body to which said disk is rigidly attached, a generator and burner, a tube connecting said generator with an inner reservoir, the inner end of said tube being extended through the said disk and bent into a spring-coil in proximity thereto, an inner reservoir suspended by said spring-coil and arranged to have its receiving-tip at the lowest point of the main reservoir notwithstanding the change of position of the latter except when the tool is held downward substantially as set forth.

4. In combination with the burner-generator and gasolene-supply tube of a tool, a handle forming the main reservoir and provided at the outer end of said handle with an inwardly-extending tubular offset, which leaves an annular space between it and the wall of said reservoir, and an inner reservoir suspended at the forward end of said outer reservoir by a spring-coil formed in the end of the said tool and having its tip in the said annular space in order that it may receive the fuel from the lowest part of the main reservoir notwithstanding the change of position except when the tool is held downward, and

the said opening through the offset serving also to allow liquid to be poured into the said main reservoir substantially as set forth.

5. A tool provided with a hollow handle serving also as a main reservoir for liquid fuel and having at its outer end an inwardly-extending part which leaves an annular space between it and the wall of the reservoir, an inner reservoir flexibly suspended at the forward end of the main reservoir and having its tip or rear end which receives the liquid arranged to remain always within the said annular space while the parts of the tool are assembled, a burner, a generator, and a tubular communication between the said generator and the suspended end of the inner reservoir substantially as set forth.

6. In combination with a hollow tool-handle body, a fixed end piece for the outer end of the same, having a central hole and tubular inward and outward offsets  $L'$  and  $L''$ , having their bores in alinement therewith, and further provided with internal screw-threads and with a groove on its outer face concentric with the said hole, screw-cap adapted to screw into the said hole and to complete the ends of the said handle, said cap being provided with a passage for compressed air and with an annular flange adapted to fit against a packing-ring in the said groove, a burner, a generator, a tool-body, an inner reservoir suspended by one end within the said handle at the forward end of the same and having its tip or receiving end always in the space between the inner offset of the outer end piece of the handle and the annular wall of the latter, and a tube connecting the generator with the said inner reservoir and constituting an elastic suspending device for the latter substantially as set forth.

7. The body of a hollow tool-handle, serving also as a main reservoir for liquid fuel, in combination with a removable disk, which constitutes the forward end of said handle, an inner reservoir flexibly suspended by its forward end from the said disk for the purpose stated, the body or frame of a tool having another disk at its proximate end, a generator and burner mounted on the said body or frame of the tool, and a tubular connection between the said generator and the said inner reservoir, the said disks being rigidly fastened together, so that they with the inner reservoir and the other attached parts may be removed together from the said handle, said disks being further provided with intervening devices which make an air-space between them substantially as set forth.

8. In combination with the body of the tool-handle, constituting also a reservoir for liquid fuel, a disk removably closing the forward end of said handle, and provided with a series of studs on its forward face the body or frame of the tool provided at its rear end with a disk having recesses formed in its rear face to receive the said studs and having also a central hole, a bolt or screw-threaded stud

rigid with the first disk and passing up through the said hole in the second, a nut engaging the said bolt or stud to lock the said disks together, a burner and generator carried by the said body of the tool, a tube extending from the said generator down through the said frame and disks and having its rear end coiled into a spring-support within the forward end of the said handle, and a supplemental inner reservoir attached at its forward end to the said spring-support and freely removable from the said handle or main reservoir with the said tool-body and the other parts named substantially as set forth.

9. In a vapor-heated tool, the combination with a mixing-chamber having an opening or openings through its side in front of the jet-block, of a casing surrounding the said mixing-chamber and provided with side openings, which allow external air to pass through to the openings in said chamber, a jet-block closing the end of the said chamber and imperforate excepting a jet-hole for vapor, a generator located between the said chamber and the said casing, a reservoir for volatile liquid and a tubular connection between said reservoir and said generator substantially as set forth.

10. In a vapor-heated tool, the combination with a mixing-chamber having side openings and tapering from the forward to the rear end, of a casing surrounding the said mixing-chamber and having side openings for air, a jet-block closing the rear end of the said chamber and imperforate except a jet-hole for vapor, a generator located between the said chamber and casing, a reservoir for volatile liquid and a tubular connection between said reservoir and said generator substantially as set forth.

11. In a vapor-heated torch, a mixing-chamber and a casing which are separated by an interval and together constitute a burner discharging through the end of the said casing and which are provided with side openings, in combination with a jet-block discharging a jet of vapor into the rear end of the said mixing-chamber, a generator located between the said casing and mixing-chamber and discharging through the said jet-block, a reservoir for volatile liquid, and a tubular connection between the said reservoir and the said generator substantially as set forth.

12. In a vapor-heated tool, the combination of a burner consisting of a mixing-chamber and concentric casing with an intervening generator, a reservoir for volatile liquid, a tubular communication between the said reservoir and the said generator, means for admitting air into the said mixing-chamber means for admitting into the said mixing-chamber the vapor produced by the said generator, and a device for primarily heating the said generator and starting the tool, consisting of an alcohol-tray detachably suspended from the said casing and provided with an incombustible

tible covering for the alcohol, permitting the fumes of the latter to be ignited above it substantially as set forth.

13. An alcohol-tray provided at its forward  
5 end with two upwardly-extending arms and  
at its rear end with a flange and having further a concave incombustible covering for alcohol in combination with the burner of a  
10 vapor-heated hand-tool, the said tray being  
attached to the sides and bottom of the cas-

ing of the said burner by screws passing through the said arms and flange substantially as set forth.

In testimony whereof I affix my signature  
in presence of two witnesses.

WILLIS MITCHELL.

Witnesses:

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