Dec. 24, 1929. L. M. M. BRIDE 1,740,471

FLUID PROJECTING APPARATUS

Filed Nov. 28, 1922 3 Sheets-Sheet 1

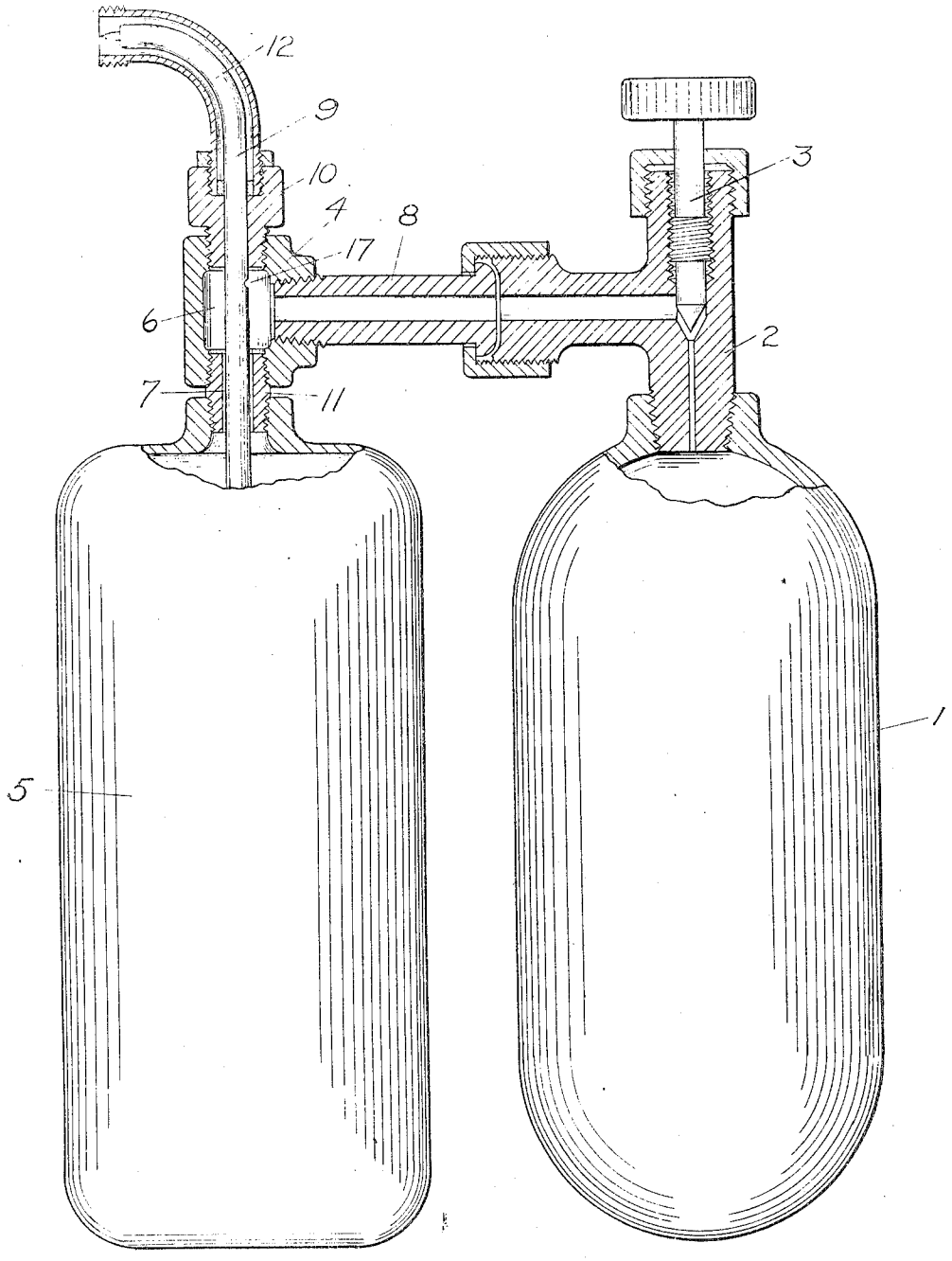



Fig 1.

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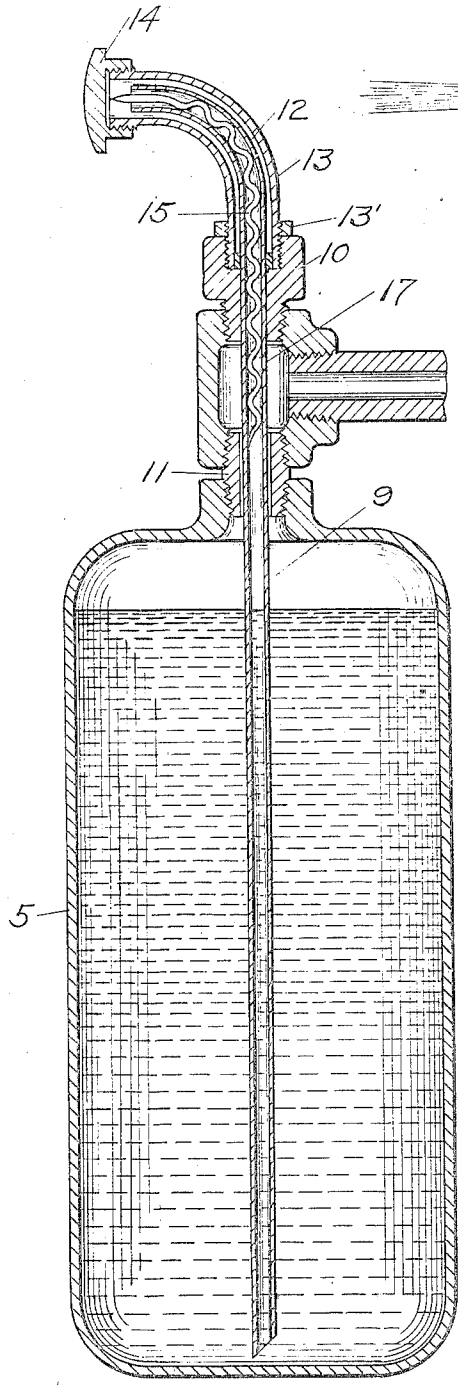



Fig. 3.

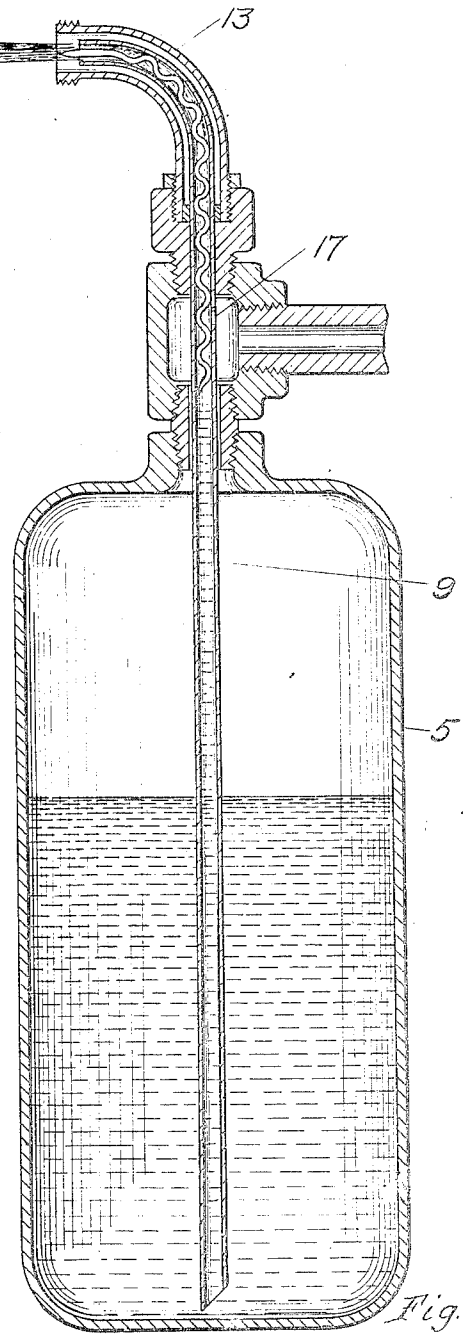



Fig. 2.

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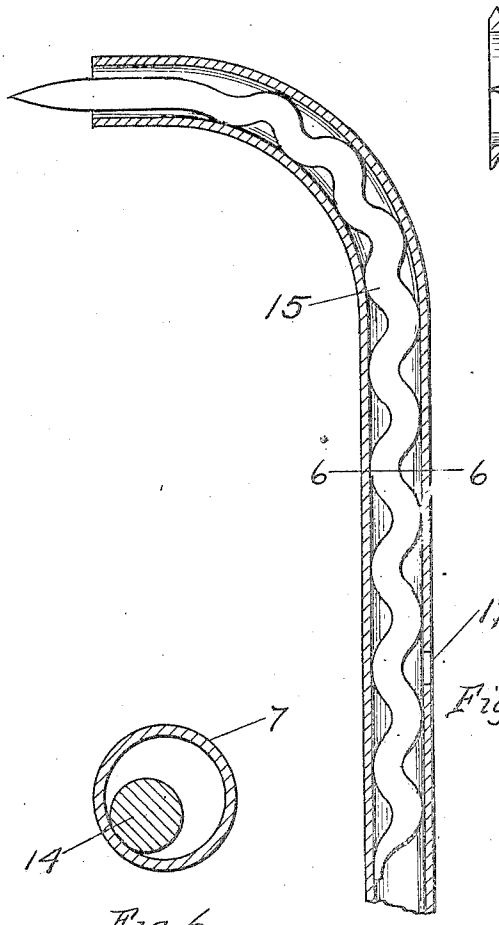



Fig. 5.




Fig. 6.

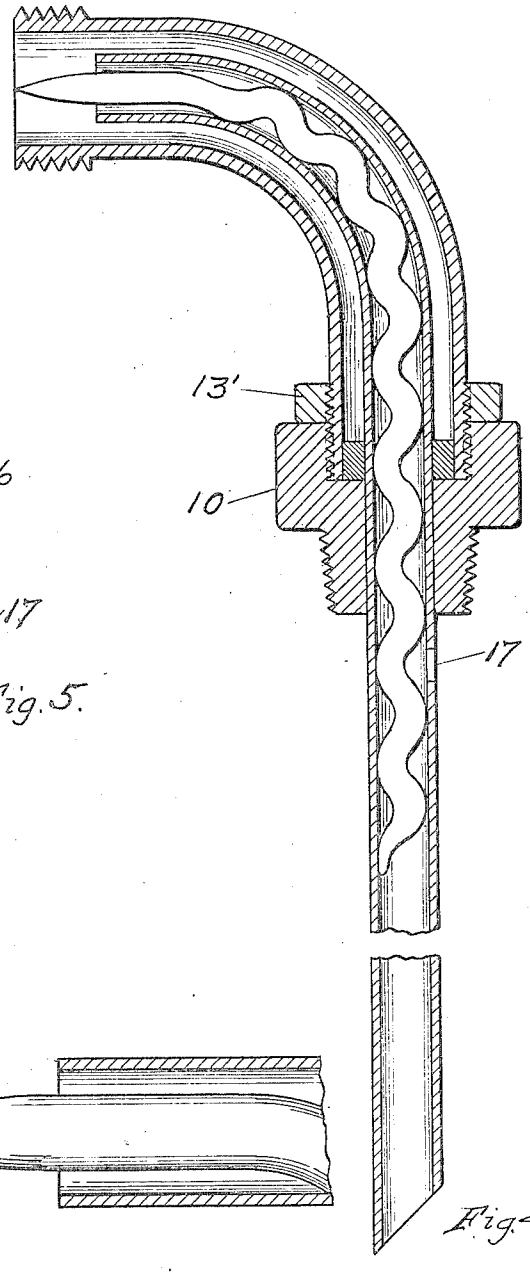



Fig. 4.

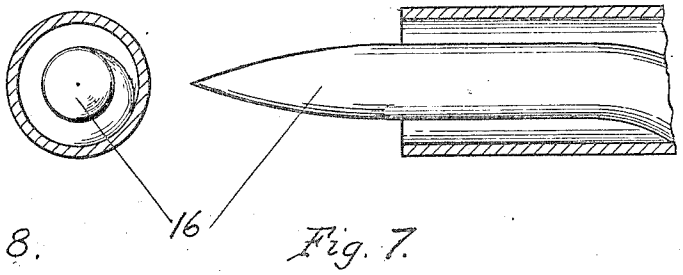



Fig. 8.

Fig. 7.

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1,740,471

# UNITED STATES PATENT OFFICE

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## FLUID-PROJECTING APPARATUS

Application filed November 28, 1922. Serial No. 603,804.

This invention generically relates to fluid projecting apparatus and more particularly it is directed to a device for the utilization of non-toxic temporarily incapacitating agents which without endangering life will produce excessive lachrymation or continuous violent sneezing.

One of the objects of this invention is to provide a method and apparatus, through the instrumentality of which, a non-toxic substance suspended in a volatile carrying agent is discharged in a manner to produce volatilization of the carrying agent and projection of the non-toxic substance at high forward and rotational velocity.

Another object of this invention is to produce an apparatus for projecting fluids (preferably of a lachrymatory or sternutatory type) to be used for military purposes, or in the dispersion of mobs, suppression of riots, to quell mutinous and other unlawful gatherings and protect homes, mints, treasuries, banks and railway transportation against invaders and the like.

A further object of this invention is to provide a small, light, compact and instantaneously operative fluid projector either of a hand or pocket type or of a design for permanent or semi-permanent installation in buildings or otherwise and with either direct or remote control of the discharge.

A further object of this invention is to produce an apparatus of the character specified having facilities for projecting a fluid at high forward and rotational velocity over an extended area and without atomization in the vicinity of the operator.

A further object of this invention is to provide a projecting apparatus, which will not produce a gaseous atmosphere in the vicinity of the operator, is simple in construction, durable, efficient in operation, easily and quickly aimed toward any point of attack or defense and susceptible of a wide range of action.

Another object of this invention is to produce a projecting apparatus having a differential pressure arrangement which permits the introduction of a certain amount of the pressure-operating fluid into the discharging stream to accelerate and disintegrate the latter.

With these and other objects in view this invention consists in certain novel details of construction, combination and arrangement of parts to be more particularly hereinafter set forth and claimed.

Briefly stated, this invention comprises a source of pressure a fluid reservoir in communication therewith, a lachrymatory or sternutatory fluid within the reservoir and means for projecting such fluid at high forward and rotational velocity and in a finely divided state from the reservoir.

Referring more particularly to the accompanying drawings in which corresponding parts are indicated by similar reference characters:

Fig. 1 is a sectionized side elevation.

Fig. 2 is a fragmentary transverse vertical section of the fluid projecting assembly.

Fig. 3 is a similar view with the nozzle capped.

Fig. 4 is a fragmentary sectionized detail illustrating the assembly of the nozzle-hood eduction-tube and rifling means.

Fig. 5 is a fragmentary sectionized detail of the eduction tube and rifling means.

Fig. 6 is an enlarged horizontal section taken on the line 6—6 Figure 5.

Fig. 7 is a fragmentary sectionized detail partly in elevation of the nozzle-end of the eduction tube and

Fig. 8 is an end view thereof.

The immediate effect of a trace of the vapor of a lachrymatory gas in the air causes profuse watering of the eyes accompanied by intense smarting, and if the concentration is sufficient this pain in the eyes becomes intolerable and it is impossible to keep them open, so that the individual subjected to the action of this gas is momentarily blinded and placed in a helpless condition.

A sternutatory gas produces temporary incapacitation by causing an immediate irritation of the nose and throat with consequent severe sneezing and coughing.

It is therefore the aim and purpose of this invention to provide an apparatus for utilizing gases of the above character for offensive

and defensive purposes so that the desired end may be accomplished without the use of bombs, grenades, high explosives, toxic gases or other mutilating or life destroying agents.

In the illustrated embodiment characterizing this invention (1) represents a pressure container capable of withstanding a pressure of approximately 2000 pounds per square inch. Owing to its economy and availability, compressed air is preferably employed as the pressure fluid, but oxygen, carbondioxide, nitrogen or other suitable gases or a combination thereof, or a liquid of a high vapor pressure may be used if desired.

(2) indicates a T-fitting which is detachably connected with the container (1) and formed with suitable fluid passages intercepted by a manually controlled needle valve (3). (4) indicates a three way coupling which is detachably engaged with the projector reservoir (5). Coupling (4) is formed with a central chamber (6) communicating with the interior of reservoir (5) via passage (7).

(8) represents a union which connects coupling (4) with T-fitting (2) and establishes communication between pressure tank (1) and projector reservoir (5). (9) represents an eduction tube which extends through alining openings in fittings (10) and (11) and into the projector reservoir to a point slightly above its bottom. The upper end of this tube is curved to provide a vaporizing nozzle (12). (13) indicates a hood inclosing the nozzle and locked in position by lock nut 13′. (14) represents a cap which is threaded on the free end of nozzle-hood (13) when the apparatus is not in use. (15) indicates a spiral core disposed within the nozzle and eduction tube for the purpose of imparting a rotary motion to the fluid as it passes through tube and nozzle. This helical core is suitably drawn out to produce the desired rifling effect and seats with a tight fit between the outside of the helix and the inside of the tube, (as shown in views 4, 5, and 6). To preclude the passage of the fluid centrally through the core, the latter is formed with a diameter slightly in excess of the radius of the tube as will be understood without further discussion.

If the rifling were terminated at the side of the tube or at the end of the nozzle or at some distance within the tube the stream would issue with a cylindrical hollow space tending to be a vacuum at the center of its axis of rotation due to the centrifugal force of the rapidly revolving stream, and the issuing stream, when subjected to atmospheric pressure would tend to disintegrate and produce a spray in the immediate vicinity of the operator, which for reasons heretofore assigned would be highly objectionable.

This action however, is prevented and the stream projected intact and at high forward and rotational velocity by terminating the helix at a point within the nozzle, spaced from its upper end and then continuing the free end of the core through the open end of the nozzle and beyond the latter coincident with the longitudinal axis of the tube, the projected end of the core being gradually tapered off to form a vacuum preventing tip (16) as clearly shown in Figure 7. The use of this tip (16) results in a gradual contraction of the ensuing stream under atmospheric pressure, rather than a sudden collapsing thereof as would otherwise be the case.

The tube (9) is fomed with a port (17) which permits a portion of the pressure fluid to enter the tube for the purpose of disintegrating and materially accelerating its fluid content. The diameter of this opening must always be such as to afford a difference in pressure at the location of the port and inlet of the tube. Likewise, it must conform in size to the character of fluid employed as a carrying agent for the toxic substance.

When the tube (9) is opened the greater pressure prevailing in the reservoir will drive the liquid through the tubes and into the atmosphere, the escaping liquid carrying with it the pressure-operating-fluid entering through the port (17) which having a high velocity greatly assists in the projection of the liquid and its dispersion and vaporization, owing to the sudden expansion of the intermingled pressure-fluid. As a rule the non-toxic lachrymatory and sternutatory incapacitating liquids used in the projecting apparatus under consideration are approximately 10% solid matter held in suspension, hence about 90% of the liquid used is inert or non-toxic and being highly volatile (carbon tetrachloride, benzene acetone, etc.) is rapidly vaporized upon projection, thus leaving the finely divided particles of non-toxic solid (chloracetophenone, etc.) suspended in the air to be driven forward with high velocity by the blast of the pressure producing means.

In view of the preceding it is evident, the high pressure utilized in this apparatus serves not only to disintegrate the dissolved solid in the non-toxic agent but likewise functions, after volatilization of the carrying fluid as a propellant to project the finely divided solid matter forward at high velocity, thus affording the greatest possible range, with the least loss of solid matter and with practically no dispersion of the non-toxic agent in the vicinity of the operator.

Having described the structural details of this invention its operation is as follows:

The pressure receptacle (1) is charged with air or an inert gas to approximately 1000 pounds per square inch and reservoir (5) is filled with a suitable fluid, which may be chloracetophenone in solution with a solvent such as carbontetrachloride, benzene or a

combination of both in suitable proportions, or brombenzylcyanide or diphenylaminechlorarsine in solution with a suitable solvent such as acetone or capsaicin in solution with benzene or alcohol. In the event brombenzylcyanide is used the container and discharge tube should be lined with enamel.

The reservoir and pressure receptacle being conditioned, the operator grasping the pressure receptacle removes cap (14) from the nozzle and directs the latter toward the target. Needle valve (3) is then opened and the fluid contents of the reservoir (5) are discharged in a vaporized form and at high forward and rotational velocity.

In conclusion it will be manifest this invention provides a fluid projecting apparatus affording a maximum discharge in a minimum time and furnishes a very effective weapon for temporarily incapacitating the individual within the range of its spray.

Although in the foregoing certain elements have been described as best adapted to perform the functions allotted to them it is to be understood that various minor changes may be resorted to within the scope of the appended claims without departing from or sacrificing any of the principles of this invention.

Having defined my invention, what I claim as new and wish to secure by Letters Patent is:

1. A fluid projecting apparatus comprising a fluid reservoir, a source of pressure, and a projecting means associated with the reservoir and cooperating with the source of pressure to discharge the reservoir contents at high forward and rotational velocity and without atomization in the vicinity of such projecting means, such means including a discharge tube extending into the reservoir and beneath the surface of its fluid content, means within the tube for imparting a spiralling movement to the ascending fluid, said means extending beyond and being concentric with the outlet end of said tube and additional means in connection with said discharge tube to disintegrate and accelerate its fluid content.

2. A fluid projecting apparatus comprising a fluid reservoir, a discharge tube extending into the reservoir, and beneath the surface of the fluid content, and projecting means associated with the tube and reservoir to force the fluid content of the reservoir through the tube and at the same time effect its discharge at high forward and rotational velocity and without atomization in the vicinity of such projecting means, said means including a helical core disposed within the tube for imparting a spiralling movement to the ascending fluid, means in connection with the helix and protruding from and being concentric with the outlet end of the tube to effect a gradual restriction of the projected fluid as it leaves the tube and a differential pressure device in connection with said tube to disintegrate and accelerate its fluid content.

3. A fluid projecting apparatus comprising a fluid reservoir, a discharge tube extending into the reservoir and beneath the surface of its fluid content, means coacting with the tube and reservoir to expel the contents of the latter through the tube at high forward and rotational velocity, said means including a helical core disposed within the upper portion of the tube to impart a spiralling movement to the ascending fluid, a tapered tip formed on the upper end of the helix and projecting beyond the outward end of the tube, said tip being concentrically positioned with respect to said outlet and a differential pressure device in connection with the discharge tube to disintegrate and accelerate its fluid content.

4. A fluid projecting apparatus comprising a fluid reservoir, means operatively associated with the reservoir for discharging its content at high forward and rotational velocity, such means including a discharge tube extending into the reservoir and beneath the surface of its fluid content, a helical core disposed within the tube adjacent its outlet end, the upper end of the helix being extended beyond the outlet end of said tube and arranged concentrically therewith to effect a gradual restriction of the fluid as it is projected from the tube and means disposed at a predetermined point in the length of the tube to admit a portion of the fluid to effect disintegration and acceleration of the fluid content of said tube.

5. A fluid projecting apparatus comprising a fluid reservoir, a discharge tube projecting into the reservoir and terminating at its upper end in a nozzle, a helix disposed within the tube to impart rotary movement to the fluid, said helix having a diameter slightly in excess of the radius of the tube to insure complete rotation of the ejecting fluid, a gradually tapered tip formed on the upper extremity of the helix and projecting beyond the outlet end of the tube and disposed in concentric relation with respect thereto to effect a gradual constriction of the fluid as it is projected from the tube and a differential pressure device in connection with said tube to disintegrate and accelerate the fluid content thereof.

6. A fluid projecting apparatus comprising a fluid reservoir, a discharge tube extending into the reservoir and terminating at its upper end in a nozzle, a helix disposed within the tube to impart rotary movement to the discharging fluid, said helix having a diameter slightly in excess of the radius of the tube to insure complete rotation of the fluid, a gradually tapered tip formed on the free end of the helix and extending beyond the end of the tube in concentric relation with respect thereto to effect a gradual restriction of the

fluid as it is projected from the tube and means at a predetermined point in the length of the tube to admit a portion of the pressure fluid to effect disintegration and acceleration of the fluid content of the tube.

7. A fluid projecting apparatus comprising a fluid reservoir, a source of pressure in communication therewith, a discharge tubing projecting into the reservoir, a nozzle secured to the upper end of the tubing, a rifling helix disposed within the tubing, said helix having a diameter slightly in excess of the radius of the tube, a gradually tapered tip formed on the upper extremity of the helix, said tip extending beyond the outward end of the tube and being arranged in concentric relation with respect thereto to effect a gradual constriction of the fluid as it is projected from the tube and additional means in connection with said discharge tube to disintegrate and accelerate its fluid content.

8. A fluid projecting apparatus comprising a fluid reservoir, a source of pressure in communication therewith, a discharge tubing projecting into the reservoir to a point adjacent its bottom, a nozzle in connection with the upper end of the tube, a rifling helix within the tube, the upper end of said helix being tapered and extended in concentric relation with respect to the upper end of the tube to prevent the formation of a vacuum and means at a predetermined point in the tube to admit a portion of the pressure fluid to effect disintegration and acceleration of the fluid content of the tube.

9. A fluid projecting apparatus comprising a fluid reservoir, a source of pressure in communication therewith, means in connection with the reservoir for discharging its contents at high forward and rotational velocity, such means including a discharge tube, a helical core within the tube to impart rotary movement to the ejecting fluid, a gradually tapered tip formed on the upper extremity of the helix and projecting from and in concentric relation with the outer opening of said tube, and a differential pressure device in connection with said tube, said device embodying an opening formed in the wall of the tube and so arranged with respect to the air supply as to disintegrate and accelerate the fluid content of said tube.

10. A fluid projecting apparatus comprising a fluid reservoir, a compressed air chamber, means for establishing communication between the compressed air chamber and fluid reservoir, a control valve in connection with such means and a projecting device for discharging the contents of the fluid reservoir at high forward and rotational velocity, such device including a tubing extending into the reservoir and a helical rifling within the tubing, such rifling having a diameter slightly in excess of the radius of the tube and having its upper end tapered and projecting concentrically from that of the tube to effect discharge of the reservoir contents at high forward and rotational velocity, and a differential pressure device in connection with said tube to disintegrate and accelerate the fluid content thereof.

11. A fluid projecting apparatus comprising a fluid reservoir, a source of pressure communicating therewith, a discharge tubing extending into the reservoir and terminating at its upper end in a nozzle, a rifling helix disposed within the nozzle and tube, such helix being diametered slightly in excess of the radius of the tubing and having its upper end tapered and projecting centrally from that of the tube, and means in connection with the nozzle and tube to disintegrate and accelerate the fluid content of the tube.

12. A fluid projecting apparatus comprising a fluid reservoir, a discharge tube projecting into the reservoir and terminating in its upper end in a nozzle, a helix disposed within the tube to impart rotary movement to the fluid, means on the upper end of the helix projecting from and in concentric relation with the outer end of the tube to effect a gradual constriction of the fluid as it is projected from the tube and a differential pressure device in connection with said tube, said device embodying means at a predetermined point in the tube to admit a portion of the pressure fluid to effect disintegration and acceleration of the fluid content of said tube.

13. A fluid projecting apparatus comprising a fluid reservoir, a discharge tube extending into the reservoir and adapted to project beneath the surface of its fluid content and projecting means associated with the tube and reservoir to force the fluid content of the reservoir through the tube and concomitantly effect its atomization and discharge at high forward and rotational velocity, such means including a source of pressure communicating with the fluid content of both tube and reservoir, a helix within the tube and a tapered tip formed on the upper end of the helix, said tip extending beyond the end of the tube and in concentric relation therewith and a differential pressure device in connection with the tube to disintegrate and accelerate the fluid content thereof, said device comprising means at a predetermined point in the length of the tube to admit a portion of the pressure fluid.

14. A method of projecting non-toxic agents of a temporarily incapacitating nature consisting in suspending a solid substance in a highly volatile carrying fluid, disintegrating and then discharging such fluid under conditions to effect volatilization of the fluid and projection of the residue at high velocity.

15. A method of projecting non-toxic agents of a temporarily incapacitating nature

consisting in suspending a solid substance in a highly volatile carrying fluid, disintegrating and then discharging such fluid under conditions to effect volatilization of the fluid and projection of the residue at high forward and rotational velocity.

16. A method of projecting non-toxic agents of a temporarily incapacitating nature consisting in suspending a solid substance in a highly volatile fluid and then discharging the carrying fluid under conditions to effect volatilization of the carrying fluid and projection of the remaining finely divided residue at high velocity.

17. A method of projecting non-toxic agents of a temporarily incapacitating nature consisting in suspending a solid substance in a highly volatile fluid and then discharging the carrying fluid under conditions to effect volatilization of the carrying fluid and projection of the finely divided residue over an extended area at high forward and rotational velocity.

18. A fluid projecting apparatus comprising a fluid reservoir, means operatively associated with the reservoir for discharging its content at high forward and rotational velocity, such means including a nozzle, a helical core therein and a tip constituting a prolongation of the core, said tip being tapered and projected beyond and in concentric relation with respect to the outlet opening of said nozzle and a differential pressure device in connection with said nozzle to disintegrate and accelerate the fluid content thereof.

19. A fluid projecting apparatus comprising a fluid reservoir, means operatively associated with the reservoir for discharging its content at high forward and rotational velocity, such means including a nozzle, a helical core and tapered tip constituting a prolongation of the upper end of the core, said tip being tapered and extending from and in concentric relation with respect to the outlet end of said nozzle and a differential pressure device in connection with said nozzle, said device comprising means at a predetermined point in the length of the tube to admit a portion of the pressure fluid to effect disintegration and acceleration of the fluid content of the nozzle.

20. A fluid projecting apparatus comprising a fluid reservoir, a compressed air chamber, means for establishing communication between the compressed air chamber and fluid reservoir, a control valve in connection with such means and a projecting device for projecting the content of the fluid reservoir at high forward and rotational velocity, such device including a tube extending into the reservoir and beneath its fluid content a helical rifling within the tube, said rifling having its upper end tapered and projecting concentrically with respect to the tube to effect discharge of the content of the tube at high forward and rotational velocity and means at a predetermined point in the length of the tube to admit a portion of the pressure fluid to effect disintegration and acceleration of the fluid content of the tube.

21. A fluid projecting apparatus comprising a fluid reservoir, a source of pressure and projecting means associated with the reservoir and coacting with the source of pressure to discharge the reservoir content at high forward and rotational velocity, such means including a discharge tube extending into the reservoir and beneath the surface of its fluid content, means within the tube for imparting a spiralling movement to the ascending fluid and additional means in connection with the last mentioned means to effect a gradual restriction of the fluid as it is projected from the tube and a differential pressure device coacting with the tube to disintegrate and accelerate its fluid content.

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