Sept. 20, 1927. 1,642,920

K. F. COOPER

FUMIGATING APPLICATOR

Filed April 6, 1921

Fig. 1.

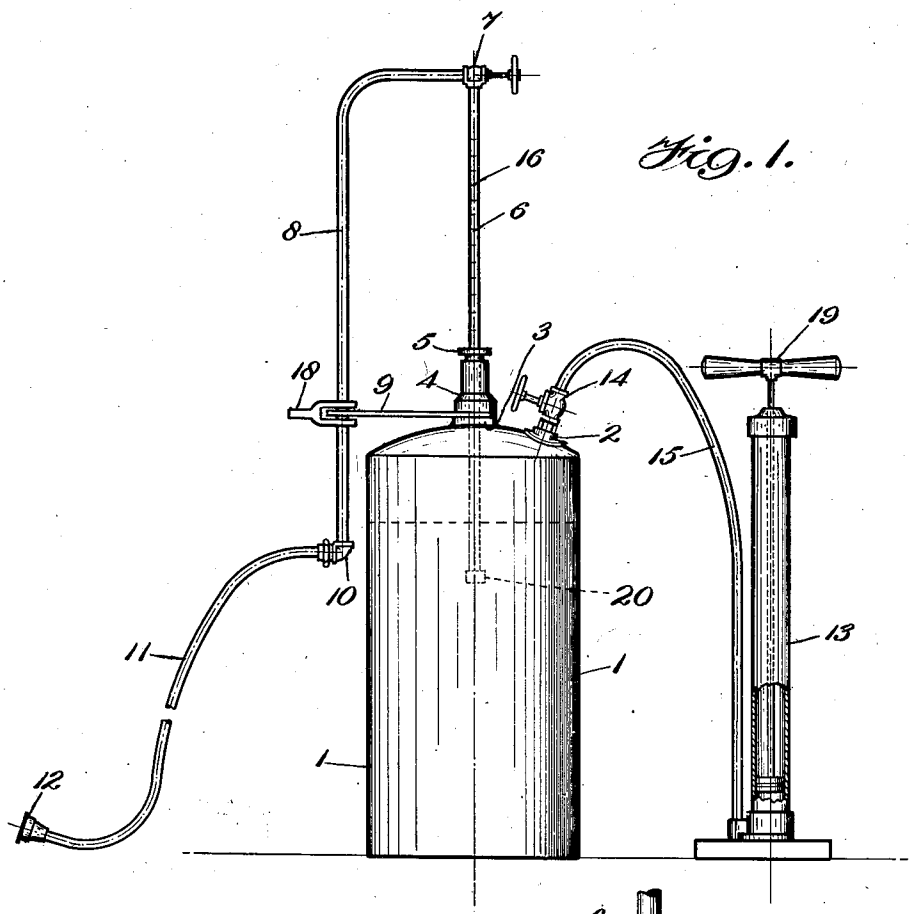



Fig. 3.

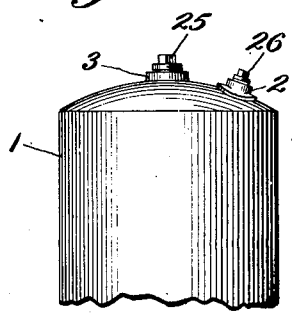
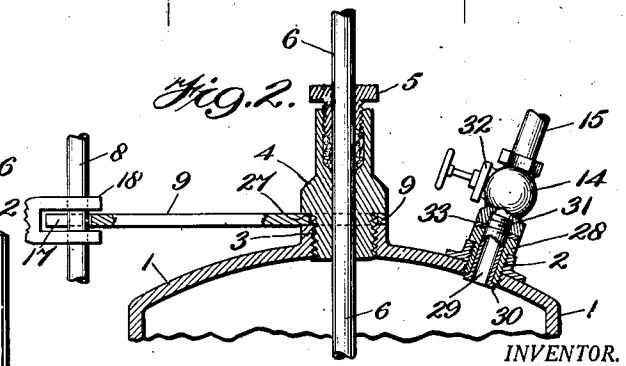



Fig. 2.




INVENTOR.

Kenneth F. Cooper,

BY T. G. Withrow

ATTORNEY

Patented Sept. 20, 1927. 1,642,920

# UNITED STATES PATENT OFFICE.

KENNETH F. COOPER, OF GREAT NECK, NEW YORK, ASSIGNOR TO AMERICAN CYANAMID COMPANY, OF NEW YORK, N. Y., A CORPORATION OF MAINE.

## FUMIGATING APPLICATOR.

Application filed April 6, 1921. Serial No. 458,961.

This invention relates to an apparatus for applying measured quantities of volatile liquid fumigants such as hydrocyanic acid and has for its object to accomplish these results in a simpler and more inexpensive manner than those heretofore proposed.

With these and other objects in view, the invention consists in the novel details of construction and combinations of parts constituting the apparatus, all as will be more fully hereinafter disclosed and particularly pointed out in the claims.

In order that the invention may be more clearly understood, it is said:

Fumigants have been used in the past for the extermination of rats, insects, scale and other pests found in buildings, vessels and upon various trees and plants. Some of the most valuable of these fumigants are liquids under ordinary atmospheric conditions and must be volatilized at the time of the application. Various methods and types of apparatus have been employed in the application of such volatile liquid fumigants, but none of these are entirely satisfactory for certain specific purposes.

For example, ships, warehouses and grain elevators, quickly become infested with rats and vermin. The volume of space to be fumigated in such structures is very large and consequently there is a very large dosage of fumigant required at an application. Accordingly, one of the objects of my invention is to provide an apparatus suitable for the transportation and application of relatively large quantities of volatile liquid fumigant used in this class of work, as well as to efficiently apply the same.

For example, hydrocyanic acid is a representative of the class of volatile liquid fumigants I desire to apply in the fumigation of such structures as those enumerated above, and the older method of application consisted in distributing throughout the ship or warehouse, wooden kegs or other suitable containers partly filled with sulphuric acid of desired strength. Muslin sacks containing the desired quantity of sodium cyanide were dropped into the acid containers and the space to be fumigated was sealed. The action of the sulphuric acid upon the cyanide of sodium liberated hydrocyanic acid which was evolved in the form of a gas.

Considerable heat is developed when such a reaction takes place and this causes some of the water in the container to be evolved as steam. The hot mixture of hydrocyanic acid gas and steam thus produced tends to rise to the highest point of the enclosure and, therefore, it is difficult to obtain a uniform and sufficient concentration of the fumigant in all parts of the enclosure under the old practice.

Also in such prior practice the extremely rapid evolution of the hydrocyanic acid frequently causes a boiling over of the contents of the wooden keg, with the result that the acid liquid comes in contact with the structure or the contents of the object being fumigated. As an excess of sulphuric acid is always used, the extremely corrosive action of this acid upon the materials with which it may come in contact often resulted in considerable damage to the structure itself, or to its contents, such, for example, as a vessel or its cargo. Furthermore, in such prior procedure, the evolution of hydrocyanic acid gas was not complete, so an excess of cyanide had to be used above that actually required, resulting in the waste of the valuable fumigant. Nor was the quantity of gas evolved uniform for each batch, it being the result of a complex chemical reaction.

In the foregoing method it was furthermore necessary to use a separate keg for each compartment. These kegs, together with the containers in which the sulphuric acid is carried, as well as the cyanide itself, had to be hoisted up to the decks of vessels, often from 20 to 40 feet above the level of the dock, or to even more inaccessible places in grain elevators. And since the handling of sulphuric acid is a well known source of danger to operators when fumigation is carried out by this method, inasmuch as this material is usually transported in stone or glass containers, which are easily broken; these features of the prior procedure constituted an additional objection.

After the period required for fumigation had elapsed in the prior methods the generating containers, with their content of unreacted sulphuric acid, had to be recovered and the contents disposed of, which was usually carried out by pouring the liquid to waste.

During this operation a certain quantity of the acid was not infrequently spilled, thus ruining the paint work and in some cases the

metal or wood, of which the fumigated structure is constructed, to say nothing of the contents of the same.

It is true that numerous types of apparatus for the application of liquid hydrocyanic acid are in use, as for example, that disclosed in the Dingle Patent No. 1,304,746, but these types are especially designed and adapted for accurate dosage of restricted spaces such as the tents enclosing orange trees. In the case of enclosures of much larger volumes, repeated applications of the fumigant are necessary with such applicators in order to obtain a proper dosage, which is a serious objection owing to the time consumed and the danger to the operators.

My new apparatus, the subject of this invention, is designed, on the other hand, to provide a suitable receptacle for handling relatively large quantities of liquid, and at the same time and without a transfer of the same to permit an application thereof in sufficiently large and accurate dosages in large structures as to thoroughly fumigate the latter, all of which will be evident from the accompanying description and drawing forming a part of this specification in which:

Figure 1 is a diagrammatic side elevational view of an applicator made in accordance with this invention;

Figure 2 is a central vertical sectional view of a portion of the parts shown in Figure 1; and

Figure 3 is a fragmentary elevational view of the shipping tank or container illustrated in Figure 1, showing the shipping plugs in place in the filling and discharge openings therein.

1 represents a container adapted to transport liquid hydrocyanic acid in sufficient quantities for the purpose in hand, which container is provided with the openings 2 and 3, used during the filling of the container, and closed by suitable plugs 25 and 26 during transportation. When the liquid fumigant is to be applied, the plug 25 in opening 3 is removed and the threaded connection 4, through which passes the tube 6, is inserted therein and screwed tight. The tube 6 passes through a stuffing box 5 attached to a threaded connection in plug 4, which stuffing box is adjusted to permit ready movement up and down of the tube 6. A second tube 8 is connected to the said tube 6 by means of an intervening angle valve 7, and suitable graduation marks 16 are placed on the tube 6. A bracket 9 is firmly held between the shoulder 27 of the threaded connection 4 and the face of the boss surrounding the opening 3, and acts as a guide for tube 8, which passes through an opening 17 in the bracket 9. The tube 8 is held in any predetermined position by means of clamp 18, and is connected as by an angle union 10 to a flexible metallic hose 11, carrying an atomizing nozzle 12. 13 is an air compressor including a check valve to which is attached one end of a flexible tube 15 and which is operated by means of a handle 19.

The other end of said tube 15 is joined to a combination valve and union member 14, comprising a threaded discharging plug member 28, adapted to engage the opening 2 when the shipping plug 26 is removed. The said plug 28 is provided with a smooth axial bore through which passes a thimble member 29, enlarged at one end to provide a shoulder 30, and having its other end threaded as at 31 to engage the threads of the valve 32, as will be clear from Figure 2. A suitable washer member 33 may be interposed between the valve 32 and the threaded plug 28, as shown.

In operation, the tank 1 is filled with a definite quantity of liquid hydrocyanic acid, and is delivered to the point of use, whereupon the plug 25 closing the opening 3 is removed and the threaded connection 4 is screwed home. By grasping tube 8 and pulling upward on the same, the combined siphon shaped tube and flexible hose is raised to a point at which the bottom 20 of tube 6 is positioned above the level of the liquid in the container 1. The valve 7 is now closed, the plug 26 is then removed from opening 2 in the container and the combination valve and union 14 screwed firmly into the opening 2. Nozzle 12 is inserted into an opening into the space, hold or compartment to be fumigated, together with such part of tube 11 as is necessary. The volume of the enclosure having been determined, the siphon tube 6 is pushed down until its lower point is below the amount of liquid fumigant required for the enclosed space as indicated by the scale markings on tube 6, whereupon the valve 14 is opened and the air compressor is operated by means of handle 19.

After several strokes have been taken, for the purpose of building up pressure in container 1 the valve 7 is opened and the operation of the air pump 13 by means of handle 19 continued until the predetermined quantity of liquid has been displaced from the container, 1. The compressed air forces the liquid above the bottom point 20 of tube 6, through said tube 6, valve 7, tube 8, angle union 10, flexible tube 11, and through the atomizing nozzle 12 into the enclosure to be fumigated. After the operation is completed, the valves 7 and 14 are closed and the apparatus transferred to such other enclosures as it may be necessary to fumigate.

It will thus be seen that the siphon comprising the rigidly connected tubes 6 and 8 constitutes an adjustable delivery means of which one leg 6 enters the receptacle through the stuffing box 5 and the other leg 8 of which passes through the opening 17

in the bracket 9 in order that said leg 8 may be guided and said leg 6 may be steadied when said siphon is adjusted up and down.

When liquid hydrocyanic acid is sprayed into enclosures it volatilizes almost instantly and during volatilization, absorbs a considerable quantity of heat. This causes a lowering of the temperature and the mixture of vaporized hydrocyanic acid and air first tends to descend and penetrate the lowest parts of the enclosure, such as crevices and pockets, and later diffuses throughout the whole enclosure. Vermin are particularly found in the lower parts of the enclosure at which points the vaporized liquid hydrocyanic acid first accumulates at the greatest concentration and thereby much more effective results are obtained with this apparatus than has been the case heretofore, because such vermin are killed quickly before migrating to more inaccessible places.

Among secondary advantages in this invention are the following: The structure, cargo and equipment in the enclosure being fumigated cannot be damaged through sulphuric acid as in the older method. The equipment is portable and easily handled. The dosage can be more accurately determined for the reason that in the case of the older method which has been used heretofore, it is a fact that a variable yield of the hydrocyanic acid is evolved from the cyanide charge. Danger in use is greatly reduced, for in my invention it is not necessary to transfer the very poisonous and volatile liquids to the applicator while operating the same, inasmuch as I discharge a measured dosage from a container, in which said liquid is transported. Measuring in my new device is accomplished by absolute displacement of the desired portion of the liquid by air under pressure and does not depend in any way upon tightness of packing, or valves, for its accuracy. A great saving of time is effected, inasmuch as it is not necessary to transfer and move to the point of application a large quantity of equipment as has been the case heretofore. The flexible tubing attached to this equipment permits the fumigation of peculiarly situated places into which it would be extremely difficult to place generators such as pots which are in use at the present time.

Now it will be obvious to those skilled in the art that the design of the various parts and combinations of parts constituting this invention may be rearranged and substituted without materially departing from the spirit of this invention, as for instance the graduations 16 on tube 6 may be placed upon tube 8 or on a guide attached to threaded connection 4. It is also obvious that this apparatus may be used for other purposes and for the application of a variety of other fumigants than the ones herein specifically mentioned, and I do not wish to be limited to the above disclosures, except as may be required by the claims.

What I claim is:

1. In a spraying device for liquid hydrocyanic acid the combination of a container in which said acid may be shipped, provided with a pair of orifices adapted to be closed by removable shipping plugs; a substantially U-shaped tube having a leg adapted to enter said container through one of said orifices when said shipping plug is removed therefrom; means adapted to maintain a liquid tight joint between said orifice and tube; a bracket associated with said last named means adapted to engage the other leg of said tube; means adapted to coact with said last named leg and said bracket to maintain said tube in a predetermined position; and means adapted to be connected to the other of said orifices when its shipping plug is removed, to expel acid from said container, substantially as described.

2. In a spraying device for liquid hydrocyanic acid the combination of a container in which said acid may be shipped, provided with a pair of orifices adapted to be closed by removable shipping plugs; an adjustable U-shaped tube provided with a valve and having a leg adapted to enter said container through one of said orifices when its shipping plug is removed therefrom; means associated with said leg adapted to indicate its position relative to said container; means adapted to maintain a liquid tight joint between said orifice and leg; a bracket associated with said last named means adapted to engage the other leg of said tube; means comprising a clamp adapted to coact with said last named leg and said bracket to maintain said tube in a predetermined position; and pressure means adapted to be connected to the other of said orifices when its shipping plug is removed, to expel acid from said container, substantially as described.

3. In a spraying device for liquid hydrocyanic acid the combination of a container in which said acid may be shipped, provided with a pair of orifices adapted to be closed by removable shipping plugs; an adjustable U-shaped tube provided with a valve and having a leg adapted to enter said container through one of said orifices when its shipping plug is removed therefrom; means associated with said leg adapted to indicate its position relative to said container; means adapted to maintain a liquid tight joint between said orifice and leg; a bracket associated with said last named means adapted to engage the other leg of said tube; means comprising a clamp adapted to coact with said last named leg and said bracket to maintain said tube in a predetermined position;

and fluid pressure means adapted to be connected to the other of said orifices when its shipping plug is removed, substantially as described.

4. In a spraying device for liquid hydrocyanic acid the combination of a container in which said acid may be shipped and provided with a pair of orifices adapted to be closed by shipping plugs; a pair of applicator plugs fitting said orifices liquid tight, one of said last named plugs being provided with a shoulder near one end and a stuffing box near its other end, and the other of said last named plugs having a smooth bore; a graduated tube passing through said stuffing box and adjustable up and down in said container; a valved connection provided with a pipe extension having a smooth exterior fitting said bore; a bracket provided with an opening held by said shoulder against said container; a delivery tube joined to said graduated tube and held in said opening; and air pressure means joined to said valved connection, substantially as described.

In testimony whereof I affix my signature.

KENNETH F. COOPER.