DDT-Xylene water emulsion dispersed by a spray plane above 0.30 pound of DDT per acre gave 95% and above larval reduction to *A. dorsalis* and *A. nigromaculis* 3rd and 4th instar larvae under favorable vegetative conditions. In areas where the vegetative conditions were adverse, over 0.40 pound of DDT in this solution gave better than 95% larval reduction. For first and second instar larvae of *A. dorsalis* and *A. nigromaculis* 0.20 pound of DDT under favorable vegetative conditions, and 0.30 pound of DDT under unfavorable conditions gave 100% control.

Seventy-five-foot swath intervals flown by the spray plane were almost as effective as 50-foot swath intervals and would be more economical. In the spray plane studies DDT dosage per acre, type of vegetation, and amount of DDT recovered were correlated with mortality. None of these factors were correlated with larval control in the aerosol studies.

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JEEP EXHAUST VENTURI AEROSOL

ROBERT W. JONES, III [1] AND JAMES R. HOLTEN [2]

Thermally produced aerosols have come to be rather widely used for mosquito control in California. The limitations imposed by wind, temperature, and humidity are recognized and the aerosols are used within these limitations as an adjunct to basic larval control measures in order to control flights of mosquitoes that do emerge.

The "plumber's nightmare" devised by Raley (1947) and adapted by Crowe (1948) has been most frequently used, because of its low cost as compared to the cost of the large commercial generators. It is a simplified version of the National Defense Research Committee aerosol generator. The venturi aerosol discussed here

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is also a modification of the National Defense Research Committee design.

There are two primary considerations to be taken into account in the design of venturi atomizers. The diameter of the venturi throat must maintain a balance between back pressures on the engine and effective break-up of the insecticide into a mist or spray. In order to obtain an effective break-up of the liquid, throat velocities of from 1000 to 1400 feet per second must be maintained. The rapid expansion of the exhaust gases through the divergent tail section of the venturi reduces the back pressures obtained sufficiently to allow for continuous operation of the unit without undue overheating or loss of power.

In addition, the type of liquid injection should allow for trouble-free operation and ease of maintenance. Gravity feed injection through ¼" i.d. copper tubing has proved sufficient for this type of unit. Radial injection in the venturi throat has the disadvantage of rapid carbonization due to the semi-vacuum created at the point of injection. Coaxial injection does not create such a "dead space" and improves performance materially because it permits high liquid flow rates with gravity feed even though the pressure at the venturi throat exceeds atmospheric pressure.

Drooling of such an exhaust unit due to non-atomization of the liquid may reduce its efficiency by as much as 50%. Such drooling is the result of impingement of the particles on the divergent wall of the tail section of the venturi and the lack of sufficient velocity of the exhaust gases to rip the liquid away from the wall again. If the exit velocity is maintained above 250 to 300 feet per second, such drooling is eliminated. It follows then, that with the throat velocities used in venturi generators, the exit diameter should never be more than twice the throat diameter.

With these thoughts in mind, trials of the National Defense Research Committee aerosol and the "plumber's nightmare" were run in an attempt to determine which was the most effective jeep aerosol unit. The NDRC design was selected and certain modifications were developed for it. The modifications of the original design made in this unit were to reduce back-pressure on the engine of the civilian jeep and to make the unit easier to clean and maintain. This unit, in more than a year's operation, seems to be from 10% to 15% more efficient than the "plumber's nightmare" because of complete atomization of the insecticide and consequent elimination of drooling. This has a further advantage in that the unit may be used in close proximity to lawns and shrubs with minimal danger of foliage "burning." It is a little more complicated to construct than is the "plumber's nightmare," but still may be built by an enterprising mechanic with a minimum of effort.

Venturi Fabrication and Installation:

Commercial bids for the manufacture of one of the units were about $30.00, while the cost to construct the unit in our shop was about $6.00 for labor and $5.00 for materials, a total of $11.00. The list of materials required is as follows:

One ⅛" black pipe tee
One ⅛" black pipe plug
One brass ¼" pipe to ¼" tubing connection
One piece ¼" copper tubing 5" long
One piece 1¼" black pipe 2" long, threaded one end
One 1¼" black pipe coupling

In addition to these materials for the venturi unit itself, the following are needed for completing the installation on the jeep:

4½' of ¼" i.d. copper tubing for feed line
Four brass ¼" pipe to ¼" tubing connections
One 1¼" black pipe nipple 10" long threaded both ends
One 1¼" black pipe tee

One brass ¼" globe valve
One storage tank

The measurements (Fig. 1) of this unit are the same as those given in the National Defense Research Committee report (1945) except for the following:

1. The throat of the venturi was increased from 7/16" i.d. to ½" i.d. to eliminate excess back pressure. Measured back pressure was obtained at any engine speed which would allow efficient operation of the exhaust venturi generator.

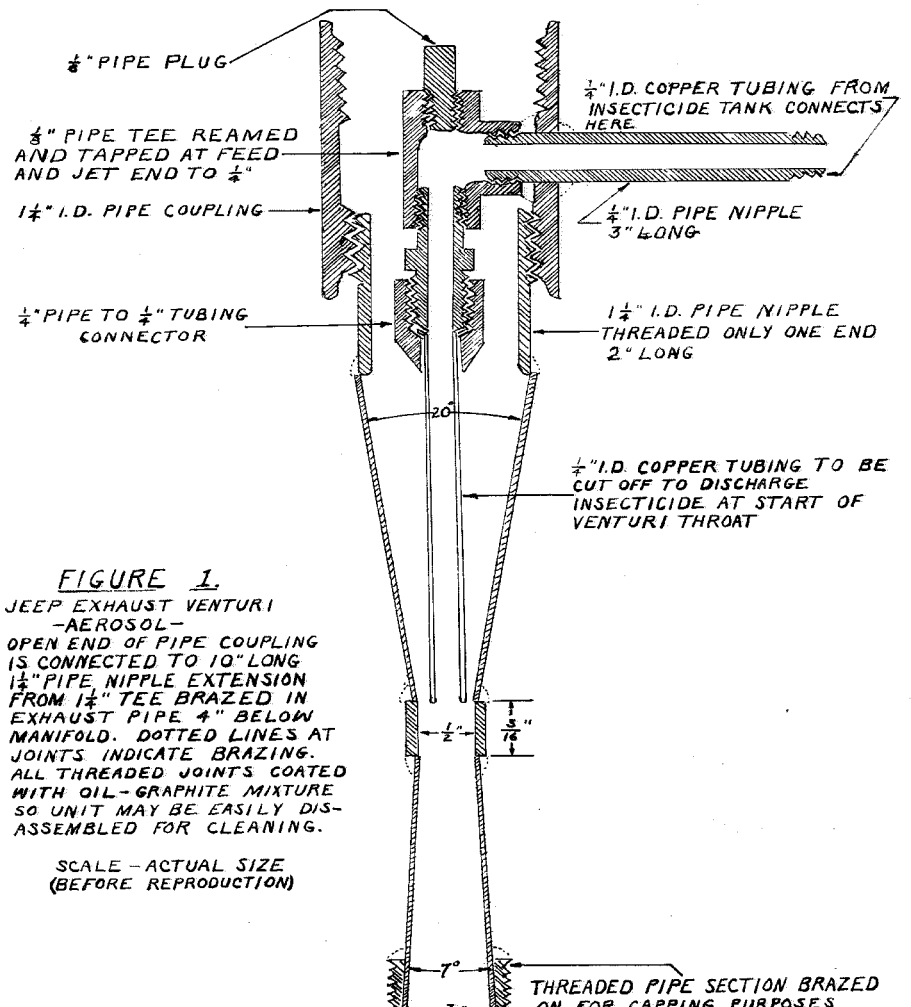

FIGURE 1.

JEEP EXHAUST VENTURI
—AEROSOL—
OPEN END OF PIPE COUPLING IS CONNECTED TO 10" LONG 1¼" PIPE NIPPLE EXTENSION FROM 1¼" TEE BRAZED IN EXHAUST PIPE 4" BELOW MANIFOLD. DOTTED LINES AT JOINTS INDICATE BRAZING. ALL THREADED JOINTS COATED WITH OIL-GRAPHITE MIXTURE SO UNIT MAY BE EASILY DISASSEMBLED FOR CLEANING.

SCALE — ACTUAL SIZE (BEFORE REPRODUCTION)

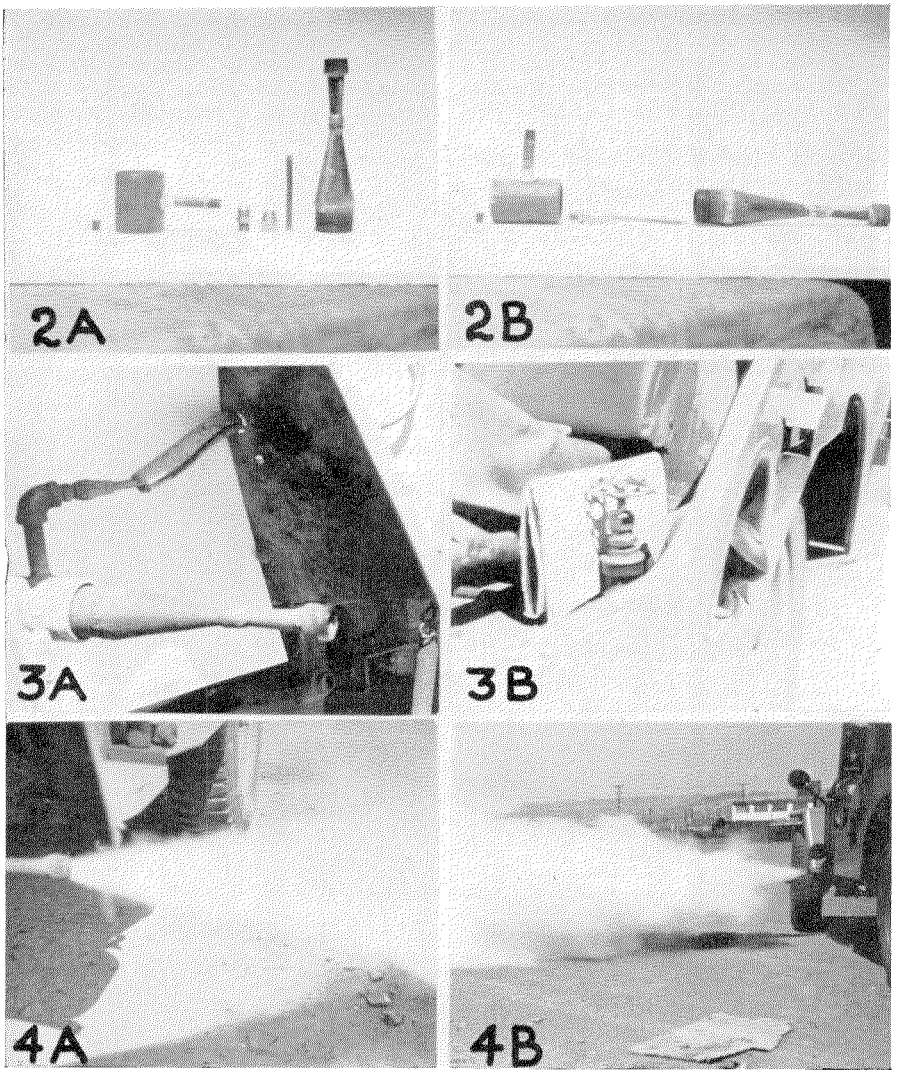

Figure 2A. Unit completely disassembled.
Figure 2B. Unit partially disassembled.
Figure 3A. Unit mounted on jeep.
Figure 3B. Control valve.
Figure 4A & 4B. Unit in operation.

2. The single-size tube assembly used (Fig. 2) was substituted for the original curved two-size jet tube so that it could be dismantled and reamed free of carbon with a minimum of tools and time.

3. The fixed mounting in lieu of the flexible mounting permits constant availability and ease of operation. The control valve on the driver's side of the jeep allows one man to both drive and operate the venturi (Fig. 3).

The convergent and divergent sections of the venturi can most satisfactorily be formed on a mandrel turned to proper size.

When installing the unit, the exhaust pipe of the vehicle is cut four inches below the manifold and a section of the exhaust pipe long enough to allow the insertion of a tee joint is removed. A 1¼" black pipe tee is then brazed into this opening. A 1¼" pipe nipple 10" long extends from the tee joint and the venturi unit is screwed onto this extension. Black pipe is used rather than galvanized for ease of brazing parts. An oil and graphite mixture is used to coat all threaded joints so that they may be broken easily even after heating, when the unit must be dismantled for cleaning. The supply tank may be of any size, shape, and capacity, but should be placed so that it is at least 18" to 24" above the venturi throat. The tank is normally placed in the rear of the jeep above the fender well.

Operation:

In operation (Fig. 4), the unit may be controlled to produce a dry fog (*aerosol*) or a wet fog (mist) by the gravity feed line control valve which controls the volume of insecticide introduced into the venturi. The jeep exhaust pipe is plugged with a 1¼" pipe plug when the venturi is in operation. A 1¼" i.d. pipe coupling is brazed onto the exhaust pipe to take this plug. When the venturi is not in use, it is capped with a ¾" pipe cap, and the exhaust pipe unplugged.

SUMMARY:

A jeep exhaust venturi aerosol based on the National Defense Research Committee design, but employing certain modifications, is described. The basic concepts of venturi aerosol design and the design modifications made to improve operation and ease the maintenance load of this unit are discussed. Photographs and a drawing illustrate the component parts of the unit and its installation on a jeep.

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