# A LIGHT TRAP AND MECHANICAL ASPIRATOR OPERATING ON DRY CELL BATTERIES

D. B. NELSON AND R. W. CHAMBERLAIN *

Entomologists have long recognized the need for a small, portable light trap for use in primitive areas which are without electric power lines, where the conventional 110-volt New Jersey trap cannot be operated. The use of generators as a power source for the New Jersey trap greatly limits portability and may be prohibitive in cost. Present modifications of this trap to operate from 6-volt automobile batteries are also of limited value because of the considerable weight of both the trap and batteries (about 15 and 60 pounds respectively), the high cost of the batteries, and the need for daily recharging.

To make live collections of mosquitoes in the swamps of Louisiana, a miniature New Jersey-type trap weighing only 1½ pounds and needing only 4 pounds of batteries was developed. It utilizes a small motor [1] operating on dry cell current. This same motor was also incorporated into a small mechanical aspirator for collecting mosquitoes found in diurnal resting places and biting on man.

The motor is of the alnico-magnet reversible type such as that used by the toy industry, and draws very little current. It has silver-graphite tips on the brushes for long life and will operate on 1½ to 6 volts. Some of these motors used in light traps have now run over 500 hours and show very little wear, although they have had no maintenance other than a tiny drop of electric motor oil on the bearings every 75 to 100 hours. These motors are operated on a 3-volt current from dry cell batteries, which also furnish current for the light. Although the motors are extremely durable for their size, failures occasionally occur; therefore, spare motors should be kept on hand for replacement.

The batteries found most satisfactory are the cylindrical 1½-volt doorbell or ignition type. Two of these batteries connected in series furnish sufficient current to operate the motor and burn a 3.8-volt bulb (as in 3-cell flashlights) constantly for at least 20 to 30 hours. The light provided is sufficient for attracting considerable numbers of mosquitoes in confined areas, such as swamps and deep woods. If, after one period of operation, the batteries are rested for 3 or 4 days, enough rebound usually occurs for a second night's operation before discarding. Traps to be used in a permanent collecting site, where portability is not important, may be operated from an automobile battery provided a 6-volt bulb is substituted for the 3.8-volt bulb.

The details of construction of the light trap are shown in figure 1. Plexiglas [2] plastic is used wherever possible because of its strength and light weight. Parts are connected with bolts whenever practicable so that the trap can be disassembled easily. Most of the bolts are secured by tapping threads into the plastic to reduce the use of nuts. For permanent fittings, a cement made of fragments of Plexiglas dissolved in chloroform is used.

The main body of the trap (1) consists of a section of ⅛-inch-thick Plexiglas tubing 10 inches long and 3½ inches outside diameter. A cone-shaped hood (2) 7

* Communicable Disease Center, Public Health Service, U. S. Department of Health, Education, and Welfare, Montgomery, Ala.

[1] Wilson's Tiny Atom electric motor with silver-graphite tipped brushes, Wilson's of Cleveland, 425 Lakeside Ave., N.W., Cleveland 13, Ohio.

NOTE: Trade names are used as a means of identifying the product and their use does not constitute endorsement by the Public Health Service.

[2] Rohm and Haas, 712 Locust St., Philadelphia, Pa., manufacturers. Obtainable in small quantities from AAA Brands, 510 Ponce de Leon Ave., N.E., Atlanta, Ga.

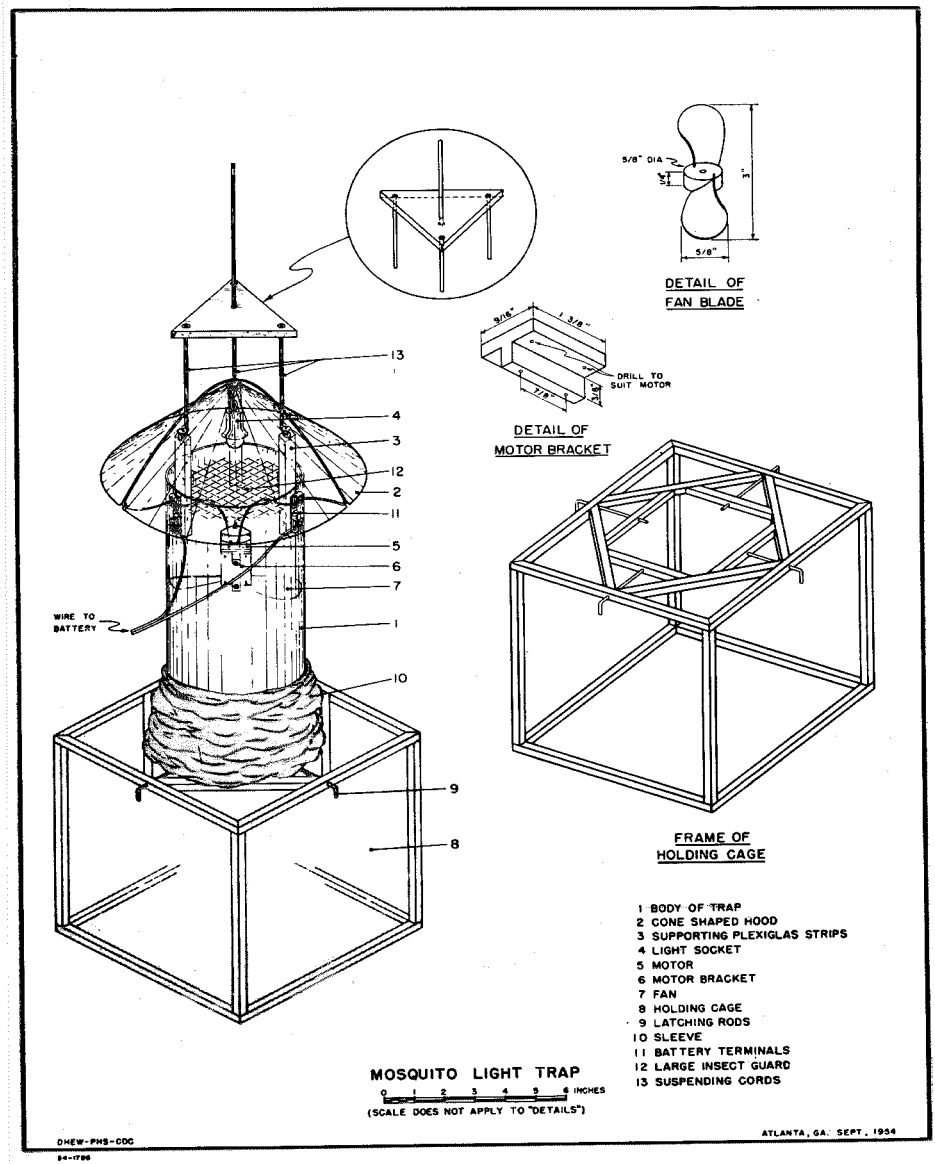
5/8" DIA
3/4"
3"
5/8"
DETAIL OF FAN BLADE
5/16"
1 3/8"
DRILL TO SUIT MOTOR
7/8"
3/4"
DETAIL OF MOTOR BRACKET
FRAME OF HOLDING CAGE
WIRE TO BATTERY
1 BODY OF TRAP
2 CONE SHAPED HOOD
3 SUPPORTING PLEXIGLAS STRIPS
4 LIGHT SOCKET
5 MOTOR
6 MOTOR BRACKET
7 FAN
8 HOLDING CAGE
9 LATCHING RODS
10 SLEEVE
11 BATTERY TERMINALS
12 LARGE INSECT GUARD
13 SUSPENDING CORDS
MOSQUITO LIGHT TRAP
0 1 2 3 4 5 6 INCHES
(SCALE DOES NOT APPLY TO "DETAILS")
DHEW-PHS-CDC
54-1786
ATLANTA, GA. SEPT. 1954

FIGURE 1.

inches in diameter and 3¼ inches high, made of Cordiflex [3] or thin cellulose acetate sheeting, is supported above the trap body by 3 fitted, Plexiglas strips with dimensions of ½ x ¼ x 4 inches (3). Hanging by its own wires from the center of this cone is a light bulb socket taken from a string of series-type Christmas tree lights (4). The motor (5) is mounted in a vertical position 2 inches from the top of the body tube by a bracket (6) made of ¼-inch Plexiglas so that the shaft is in the central axis of the tube. To the shaft of the motor is attached a 3-inch fan with blades of Cordiflex (7). The hub of the fan is a small disc of Plexiglas with a small central hole for tight insertion of the motor shaft. A ready-made plastic model airplane propeller has been found to operate with nearly equal efficiency.

At the bottom of the body-tube are 4 holes equally spaced for attaching a 7 x 7 x 7-inch plastic cage. This cage (8), designed for capturing specimens alive, is made of ¼-inch strips of Plexiglas and covered with 32 x 32 mesh Lumite [4] plastic screening. At the top of the cage are 4 small rods (9) which slide through holes in the top braces and into the holes in the bottom edge of the body-tube, latching the cage to the trap. A marquisette sleeve (10) slightly larger in diameter than the body-tube is stitched to the screening of the top of the cage and slides up on the tube when attached.

If it is desired to substitute a cyanide jar for the cage, it will be necessary to modify the trap by the addition of a screen cone. In doing this, care should be exercised not to interfere with the free down-draft from the fan or the efficiency of the trap will be considerably reduced.

Mounted near the top of the body-tube are 2 double-clip brass connectors (11), to which the wires from the light, motor and batteries are connected. Three small pieces of Plexiglas are mounted inside and near the top of the body tube to support a ¼-inch mesh hardware-cloth moth and beetle guard (12). The trap, less batteries, is hung by cords (13) from the braces supporting the cone-shaped hood.

The principle of the aspirator is one of centrifugal air displacement, with incoming air supplied through the aspirator tube to the center of the fan hub. A 6-volt switchman's lantern battery was found to be the best source of current for the aspirator, as high fan speed is necessary for efficient operation. Also the lantern battery is small enough to fasten to the collector's belt or fit into a pocket.

The details of construction of the aspirator are shown in figure 2. Two circular pieces of Plexiglas ¼-inch thick and 3 inches in diameter, held ¾-inch apart by 4 equidistant Plexiglas spacers on the periphery, form the housing for the fan. The fan, consisting of 4 Cordiflex blades set in a Plexiglas hub, rotates between the 2 discs with only enough clearance to prevent rubbing. The motor shaft runs through a small hole in the exact center of one disc. A depression is turned out on the central portion of the outer surface of this disc to receive the convex portion of the motor. The flange on the base of the motor is cut away to allow a close fit against the disc so that it can be cemented into place.

A tapered hole is bored in the center of the other disc, opposite the motor, of sufficient diameter to permit snug accommodation of a No. 5 rubber stopper. The collecting assembly is firmly fitted into this hole.

The collecting assembly is made up of one No. 5 rubber stopper, two No. 6 rubber stoppers, a plastic cylinder 28 mm in diameter and 70 mm in length (a cut off Lusteroid centrifuge tube [5]), one piece of glass tubing 12 mm x 55 mm, and another of the same diameter and approximately 6 inches long. All the stoppers are bored to allow insertion of the glass

[3] A type of plastic sheeting used in rear windows of convertible automobiles. It, or similar material, may be obtained from automobile body shops in most cities.

[4] Chicopee Manufacturing Corporation of Georgia, Lumite Division, 40 Worth Street, New York 13, New York.

[5] Obtainable from any scientific supply house.

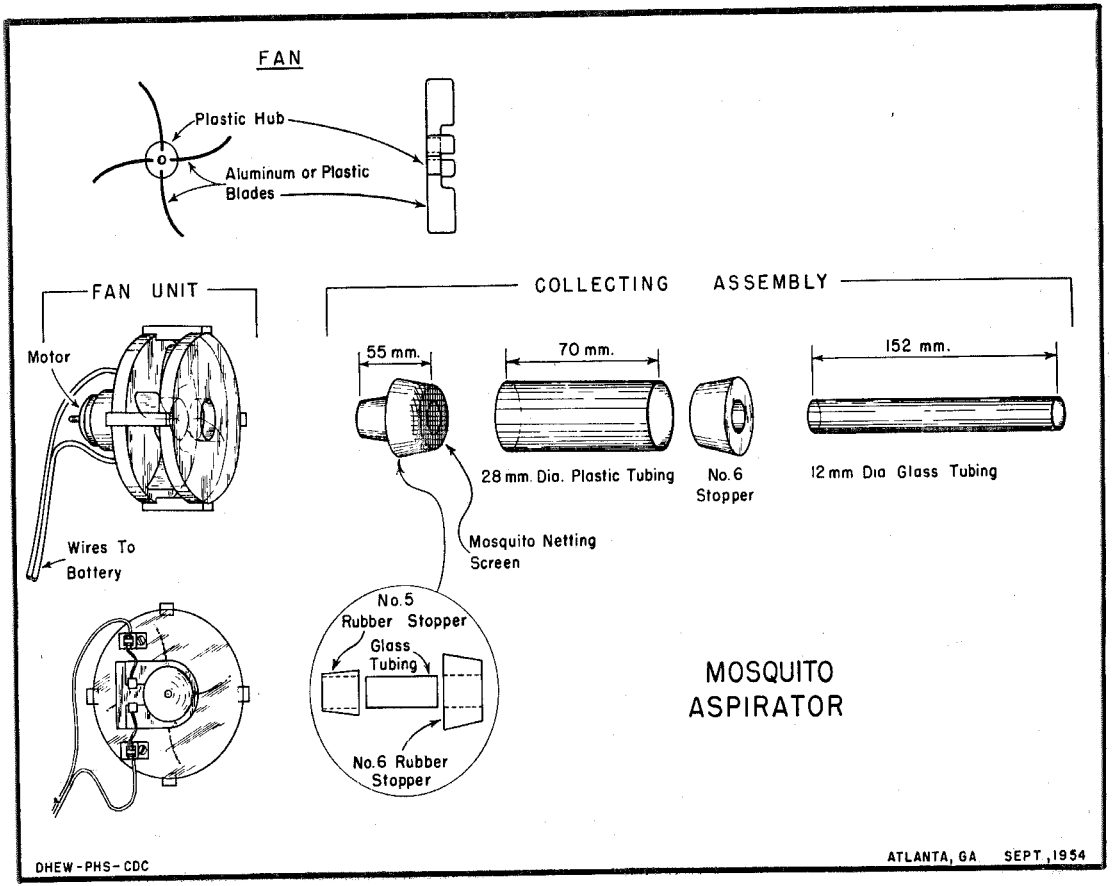
FAN
Plastic Hub
Aluminum or Plastic Blades
FAN UNIT
Motor
Wires To Battery
COLLECTING ASSEMBLY
55 mm.
70 mm.
152 mm.
28 mm. Dia. Plastic Tubing
No. 6 Stopper
12 mm Dia Glass Tubing
Mosquito Netting Screen
No. 5 Rubber Stopper
Glass Tubing
No. 6 Rubber Stopper
MOSQUITO ASPIRATOR
DHEW-PHS-CDC
ATLANTA, GA SEPT., 1954
54-1766

FIGURE 2

tubing. The No. 5 stopper fits into the hole bored in the plastic disc. One No. 6 stopper is attached back-to-back to the No. 5 stopper by the short piece of glass tubing. This No. 6 stopper then fits into the plastic tube. A piece of mosquito netting is stretched across the stopper at this juncture to prevent mosquitoes from passing into the fan. The remaining No. 6 stopper, into which the longer glass tube is inserted, is fitted into the other end of the plastic tube.

Short leads from the terminals of the motor are fastened to brass connectors on the edge of the fan housing for convenient attachment of wires from the battery.

As many as 100 mosquitoes may be collected at one time before it is necessary to discharge them into another container. The collecting assembly can be disconnected quickly from the fan unit and, by blowing gently, the mosquitoes may be discharged into a small cage.

The described aspirator and light trap were used to make collections during the summer with encouraging results. The mechanical aspirator has proved to be superior to the mouth type in that it is less fatiguing to the collector and has greatly increased the number of mosquitoes taken in a given time in biting or resting collections.

The main disadvantage of the trap over the standard New Jersey type is its limited range of mosquito attraction because of its weak light. Most efficient use is made of its light, however, if the trap is placed in wooded areas where lights cannot carry far regardless of intensity and the mosquito populations are more apt to be high. The composition and density of the collections appear to be fairly consistent for a particular area, indicating that the samples obtained may give a reliable index of the light-attracted mosquito population.

For use in primitive areas it is believed that the advantages of the miniature trap outweigh its disadvantages. Its light weight, freedom from dependence upon a power line supply of current, and relatively low cost of operation in view of its portability, make it useful for special operations.

# TEMPORARY CONTROL OF ADULT MOSQUITOES AT OUTDOOR PLACES OF PUBLIC ASSEMBLY[1]

W. C. BAKER AND H. F. SCHOOF

During 1953, preliminary studies were conducted at a drive-in theatre in Savannah, Georgia, to determine effective means of achieving temporary nighttime control of several species of pest mosquitoes. Emphasis was placed on the species of mosquitoes present, the relationship of mosquito activity to the efficacy of treatment, and the evaluation of several insecticidal formulations.

The test area was a drive-in theatre (6 acres) located in a lowland surrounded by wooded areas. A nearby field of approximately the same size was used as an untreated check zone.

Treatment of the drive-in theatre area was accomplished by means of a portable jet propulsion fogging unit fitted with a small aperture nozzle. Maximum delivery obtained with this nozzle was 0.135 gallon (512 ml.) of insecticide per minute. At a distance of 20 feet, 51 per cent of the insecticidal particles were in the range of 1 to 19 microns in diameter, 35 per cent

[1] From the Communicable Disease Center, Public Health Service, U. S. Department of Health, Education, and Welfare, Savannah, Georgia.