

water to obtain air if there are no aquatic plants available. Several environmental factors which affect the operation of the trap were discussed.

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A PORTABLE PNEUMATIC SPRAY UNIT¹

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In recent years a number of appliances have been developed for producing insecticidal fogs or mists for the control of adult biting flies. Some of these are highly efficient, but almost all of them depend upon a vehicle of some sort, either as a source of power or as a means of transport. There remained a need for a unit that would produce a useful volume of insecticidal mist, but would be sufficiently light and portable to be operated independently of existing roads or trails.

The subject of this paper is a unit developed from one produced at the Orlando, Fla., laboratory of the Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture (Husman, 1953), which was originally intended to be operated from the engine of a jeep or similar vehicle. A later modification, powered by a small air-cooled engine, was mounted on a small hand-cart. The sprayer developed at Kamloops (Figs. 1-5) utilizes an extremely light gasoline motor coupled to an air compressor slightly smaller than that in the prototype, and is mounted on a pack-frame. The total weight, including engine, compressor, two-gallon tank, spray boom, and all connec-

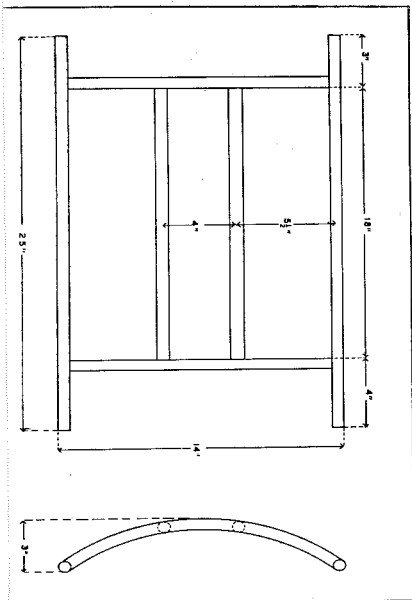
tions, but without insecticide, is 40 lb. and the unit can be carried with ease wherever a man can go.

The pack-frame is made of 3/8-inch steel tubing (electrical conduit) with welded joints. The design and dimensions are given in Fig. 1. The frame is supported on the back by a strip of canvas 24 x 24 inches, laced to the frame with a cord that passes through six brass grommets in each of the opposite ends of the canvas. The load is carried to the shoulders by two wide canvas bands 54 inches long, each end of which terminates in a leather strap. The straps engage in buckles bolted to the lower ends of the outer bars of the frame, and the band passes from one buckle through an 8-inch slit in the canvas 2 1/2 inches below the upper margin, wrapped twice around the upper crossbar, and returns through the slit and down to the other buckle. The leather straps permit adjustment of length to suit the operator.

The engine is one of a series produced by Power Products Corp. of Grafton, Wis. It develops 1.2 h.p. at 3300 r.p.m., and weighs 16 1/2 lb. complete. Some minor changes were necessitated by the attachment of the engine to a vertical base. The original rectangular fuel tank was removed, and a new one of somewhat streamlined form, made of aluminum

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1. Plan and elevation of steel pack-frame; material, 3/8-inch steel conduit.

heet, was attached above the engine. The carburetor was rotated 90° at its point of attachment.

The compressor is an oilless vane-type machine, with a rated output of 5.6 c.f.m. at 10 p.s.i., and weighing 8½ lb. To synchronize the direction of rotation of engine and compressor, a hole was bored in the blind end of the compressor shaft and a threaded extension was screwed into it to accommodate the flexible coupling. Since this was done, it has been learned from the manufacturers (Gast Mfg. Corp., Canton Harbor, Mich.) that a few compressors are available with a clockwise rotation. The governor of the engine was set down to 2000 r.p.m. to avoid overloading the compressor.

The insecticide tank is formed from 1/2-inch aluminum tubing, as used in portable irrigation systems. It is mitted to form a U having a base of 10 inches and

arms of 9 inches on the center line, giving outside dimensions of 15 x 11½ inches. Inside clearance between the arms is 5 inches. This tank has a capacity of 2 imperial (2.4 U. S.) gal. In future models, it is proposed to use 6-inch tubing with side arms of 11½ inches on the center line. This will hold 3.4 imp. gal. A small tube connecting the tops of the two arms of the U equalizes pressure between them. The top of the right-hand arm has a filler-cap and two 1/8-inch hose connections welded in. One of these is the air inlet, and the other leads to a 1/8-inch copper tube which extends to within 1/4-inch of the bottom of the tank and forms the insecticide outlet.

From the outlet connection of the compressor, a 1/4-inch nipple leads to a tee that divides the air stream. One branch leads to another tee to which are connected the air-line pressure gauge and the air-line to

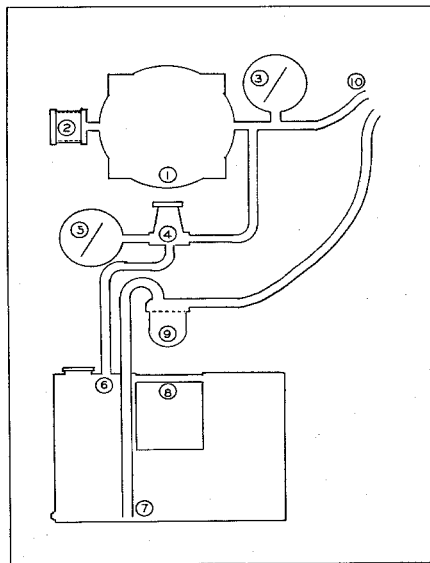


FIG. 2. Flow diagram of pneumatic sprayer. 1, Compressor; 2, air inlet filter; 3, boom air-gauge; 4, by-pass regulator; 5, tank air-gauge; 6, air inlet to tank; 7, insecticide outlet; 8, tank equalizing tube; 9, strainer; 10, air to boom.

the nozzles. The other is connected to a by-pass regulating valve and gauge, and thence by a flexible tube to the insecticide tank. The outlet from the tank leads to a strainer-bowl and thence to the liquid side of the nozzle boom.

The nozzle head is formed of two loops of copper tubing, one each for liquid and air. Short nipples of $\frac{1}{8}$ -inch copper tube are brazed in at suitable intervals, and are connected to the nozzles by brass fittings. The boom is made of two $\frac{1}{4}$ -inch pipes welded together for part of their length but widely spread at their outer ends, where they are brazed, each to its proper loop. The air line is 19 inches long, and terminates at its inner end in a brass hose coupling. The liquid line is 22 inches long and its inner end is offset to allow space for manipulation of hose couplings and the shut-off valve. The straight portion of the boom is enclosed in a wooden handle that stiffens the assembly and pro-

vides a convenient grip. Two $3\frac{1}{2}$ -foot lengths of oil-resistant hose connect the boom to the machine.

The coarse nozzle head is a cluster of three pneumatic nozzles connected to the boom by $\frac{1}{4}$ -inch copper tubing and $\frac{1}{8}$ -inch brass fittings. The nozzles used are the combination No. 60100-140-5270 made by Spraying Systems Co., 32 Randolph St., Bellwood, Ill. A finer mist can be obtained by using a separate head with a cluster of six No. 40010-120-6-360 nozzles. The change from a six- to three-nozzle assembly may be made by plugging the unused outlets, but it is more convenient to have a separate three-nozzle boom which can be attached or detached by the manipulation of the two hose couplings at the base.

In operation, the by-pass regulator is set to give a pressure of 10 p.s.i. in the tank. The air-line pressure is about 5 p.s.i. The output with the coarse head

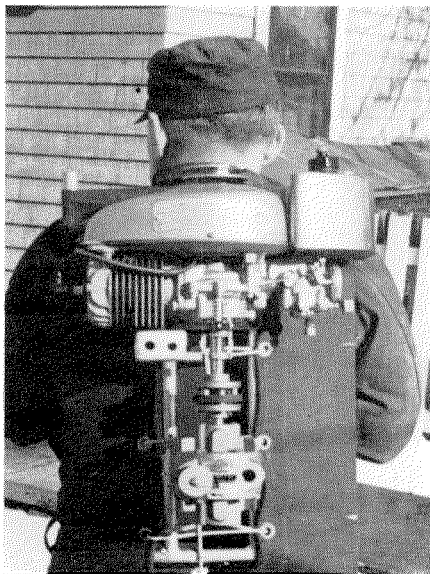


FIG. 3. Engine and compressor mounted on pack-frame.

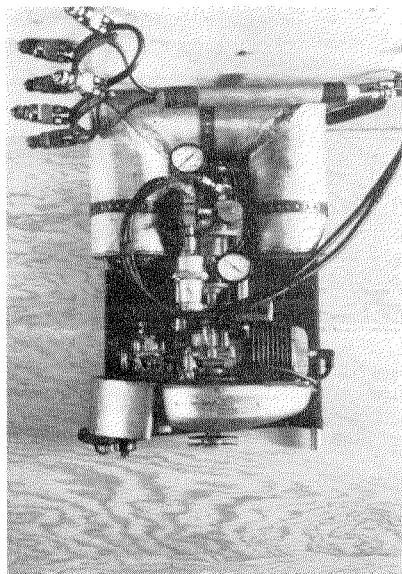


FIG. 4. Complete sprayer unit.



FIG. 5. Sprayer in operation.

.75 gal. per hour; with the fine head, .75 gal. per hour (22.5 and 18.9 U. S. l.).

The performance of this type of machine has been thoroughly assessed and reported elsewhere (Brown and Watson, 1953). The present model has the advantage of portability, which makes it available for biting-fly control in such situations as logging operations, where workers work far in advance of any trails. Fully loaded with fuel and insecticide, the unit weighs 58 lb. When it is in use the load of insecticide, about 18 lb., is used in eight minutes. Since the machine

is then set down for reloading, excessive fatigue in the operator is unlikely. If a penetration of 100 yd. downwind be assumed, with the operator making a speed of 1 m.p.h. in heavy bush, a single load would treat 6.6 acres. In open country, with favourable conditions, this coverage could be greatly increased.

SUMMARY. A portable, back-pack mist sprayer for control of adult biting-flies is described. The unit is power-driven, holds two imperial gallons of insecticide, and has an output of 15.75 to 18.75 gal. per hour. It is designed especially for use in areas where roads and trails are lacking, and weighs about 58 lb. when fully loaded with fuel and insecticide.

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