

A LIGHT, PNEUMATIC SPRAYER FOR INSTALLATION ON VEHICLES¹

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During the last few years several insecticide dispensers have been developed for use on vehicles. Most of this equipment has employed the heat and pressure of the exhaust to disperse the insecticide as a smoke or fog. Some types of exhaust units have been effective in the control of mosquitoes and flies over small areas, but none is capable of dispersing a sufficient volume of fog for adequate coverage of large areas. More important, all of them are injurious to the vehicles on which they are installed. With some types the motor must be raced to produce adequate heat and volume of exhaust, and with others the installation results in back-pressure on the manifold of the engine.

A sprayer that overcomes the most serious faults of the exhaust-type units has been developed at the Orlando, Fla., laboratory of the Bureau of Entomology and Plant Quarantine. Driven by a V-belt operating on a V-pulley attached to the regular generator pulley, it is capable of delivering insecticide solutions and emulsions at volumes up to 40 gallons per hour. Small, light-weight, and adjustable to fine or coarse sprays, it is adaptable to most types of residual treatment or space spraying in buildings, as well as for outdoor areas.

CONSTRUCTION: Compressor.—A vane-type air compressor was selected in prefer-

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ence to other types because of its lighter weight and greater air volume at low pressure. This type of compressor also produces a uniform pressure, thus eliminating the need for an air tank. It is equipped with a 3½-inch A-section V-pulley and a 3/16-inch brass rod, which is bolted to the side of the compressor to guide the belt. Four 5/16-inch holes are drilled in the base for mounting it on the platform, and the extended legs are cut off. This unit is driven by a 28-inch A-section V-belt. A ¼-inch nipple, ¼-inch elbow, and ¼- by ⅜-inch brass hose coupling are screwed into the air outlet side of the unit. An oil-resistant rubber hose ⅜ inch by 10 feet is clamped onto the hose coupling and extends from the compressor to the regulator valve on the tank in the rear end of the vehicle. A ⅜-inch street elbow, one ⅜- by 2-inch nipple, one ⅜-inch elbow, and one ⅜-inch close nipple are installed in the air breather line making it possible to lower the intake air breather. One ⅜-inch close nipple with a ⅜-inch elbow is screwed into the breather unit for the attachment of the oiler.

Mounting Bracket for Compressor.—The mounting bracket is constructed of 1½- by 1½- by ⅜-inch angle iron, 9 inches in length. A piece large enough to allow a 98° bend is cut out 5 inches from the end, and the joint of the bracket is welded. Two ½-inch holes are drilled for mounting on the cylinder head studs. A 4- by 4½- by 5- by ⅜-inch iron plate is welded to the sides of the angle iron and half of a 4-inch hinge is welded to it.

Air-Compressor Platform.—The air-compressor platform, an iron plate 7¾ by 4 by ⅜ inch with four 5/16 inch holes drilled for mounting the compressor, is welded to the other half of the hinge. This platform is hinged to the mounting bracket, to make

it possible to engage or disengage the air compressor unit by means of a control cable.

Control Cable for Compressor.—A 6-foot flexible cable, held in position by clamping to the cylinder-head bolt, is connected through a spring to the air compressor for maintaining proper tension on the drive belt.

Power Take-Off.—The generator pulley for power take-off is a standard jeep pulley with a 5-inch A-section V-pulley welded to the flat portion and to the side of the V-pulley which drives the generator.

Insecticide Supply Tank.—The supply tank is constructed from a 5-gallon government-issue auxiliary gas can, placed in the rear compartment of the vehicle. The fluid supply line is a standpipe $\frac{1}{8}$ by 18 inches, extending from the top of the tank to within $\frac{1}{4}$ inch of the bottom. It is held in place by a threaded $\frac{1}{4}$ -inch sleeve welded into the top of the tank. A $\frac{1}{4}$ -inch line strainer is connected to the top end of the standpipe by a $\frac{1}{4}$ -inch elbow and a $\frac{1}{4}$ - by $1\frac{1}{2}$ -inch nipple. A $\frac{1}{4}$ - by $\frac{3}{8}$ -inch hose coupling is screwed into the end of the strainer, and a $\frac{3}{8}$ -inch hose is clamped to it.

Regulator Bypass Valve and Gage.—The regulator bypass valve and the liquid-pressure gage are connected by two $\frac{1}{4}$ -inch close nipples to a $\frac{1}{4}$ -inch tee which is mounted on top of the tank by means of a $\frac{1}{4}$ -inch (i.d.) threaded sleeve welded into the tank. The valve controls the air pressure in the supply tank, which in turn governs the rate of liquid flow to the nozzles. A $\frac{1}{4}$ -inch cross equipped with two $\frac{3}{8}$ -inch hose couplings is screwed onto the regulator for attachment of the rubber hose air lines, which are held in place by clamps.

Spray Boom.—The spray boom consists of two $\frac{1}{8}$ -inch pipes welded together, one 22 and the other 19 inches long. The liquid line is 22 inches long and is offset 3 inches at one end for the installation of the liquid shut-off valve and hose coupling, and 4 inches at the other end for the $\frac{1}{8}$ -inch pipe coupling for attaching the nozzles. The air line is 19 inches long with

threaded ends for nozzle and hose couplings. Two $\frac{3}{8}$ -inch by 15-foot oil-resistant hoses, one for air and the other for liquid, are used. They are held in place by hose clamps.

Nozzles.—The nozzle head consists of six pneumatic nozzles connected by means of two $\frac{1}{4}$ - by 24-inch pieces of copper tubing; $\frac{1}{4}$ - by $\frac{1}{8}$ -inch brass fittings connect the nozzles to the tubing and the tubing to the boom. A No. 30 set-up (Nos. 40100 fluid and 120-6-35-60 air nozzles) is used when very small particle sizes are required. When larger particles are desired for residue spraying, the mist nozzles can be removed and replaced by others (set-up No. 29, Nos. 60100 fluid and 140-6-52-70 air nozzles) which will produce a coarser spray.

The entire unit, including air compressor, brackets, tank, hoses, boom, and nozzles weighs approximately 50 pounds.

INSTALLATION ON THE VEHICLE. The oil filter of the vehicle is removed from its position above the generator and mounted on the inside of the left front fender. This is done by using the same bracket, with an additional $7/16$ -inch hole drilled to fit the bracket on the two left front head bolts. The oil line from the pressure system will be long enough, but the return oil line will have to be replaced with a longer hose. This change in location does not impair the function of the filter.

The air compressor is bolted on a platform, which is held in place by a bracket bolted to the cylinder head of the engine just above the generator (figure 1). The compressor is operated off the generator drive by means of a V-belt; a V-pulley is welded to the generator pulley to accommodate the V-belt. A lock-type flexible control cable is mounted on the instrument panel of the vehicle so that the driver can engage or disengage the compressor at will.

A $\frac{3}{8}$ -inch oil-resistant rubber hose is connected to the compressor and extends to the supply tank situated in the rear of the vehicle. Two 15-foot $\frac{3}{8}$ -inch oil-resistant rubber hoses connect the tank to the spray boom, one being for liquid and

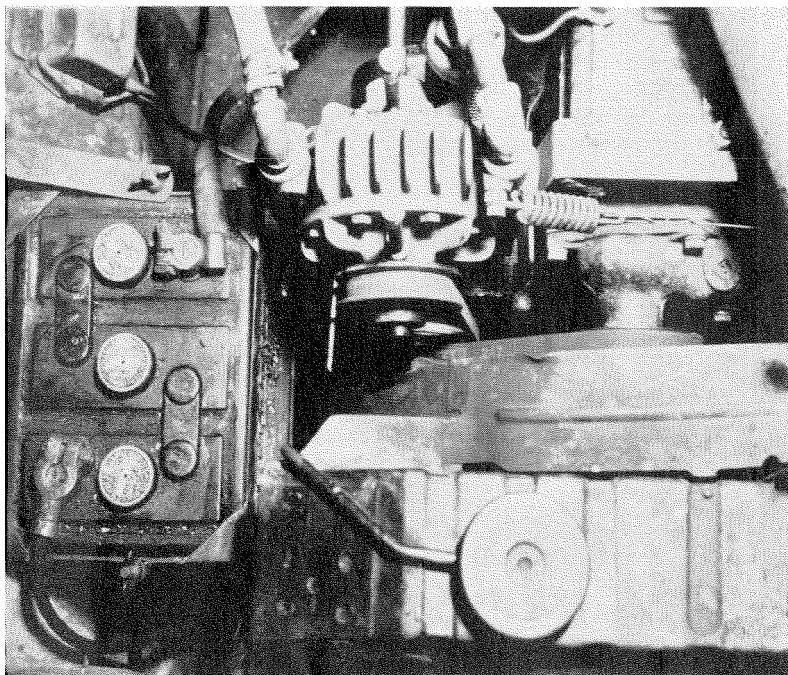


FIG. 1. Air compressor secured to cylinder head of engine.

the other for air. A valve on the liquid line enables the operator to turn the spray on and off as needed (figure 2). The air line is open at all times, allowing air to escape through the nozzles.

The unit can be mounted on a small platform equipped with wheels or skids and powered by a 2- or 2½-hp. gasoline engine or a 1-hp. electric motor (figure 3). Owing to its small size and light weight, it can either be transported in a vehicle or pulled by hand. Larger vane-type air compressors can be used to operate additional nozzles or to allow an increase in the flow rate while maintaining the same break-up of spray material.

OPERATION. The air-compressor unit will compress 8.3 cubic feet of air per minute at a pressure of 20 pounds per square inch when the vehicle is operated in low-low gear at 2 m.p.h., low gear at 4 m.p.h., or second gear at 8 m.p.h.

The liquid flow rates at various tank air

pressures with the two nozzle systems are as follows:

Pounds per square inch	Gallons per hour	
	3-Nozzle system	6-Nozzle system
5	9.7	8.0
10	27.0	14.0
15	39.0	30.0

A six-outlet nozzle (set-up No. 30), is used for space sprays requiring very small droplets. When larger droplets are needed for premise treatment and outdoor areas, a three-outlet (set-up No. 29) nozzle is used, and the other three outlets on the boom are plugged. The percentages of droplets of various sizes produced by each type of nozzle are as follows:

Set-up No.	0-	41-	81-	121-	160-
	40μ	80μ	120μ	160μ	200μ
29	48.5	37.5	11	2.5	0.5
30	71	29			

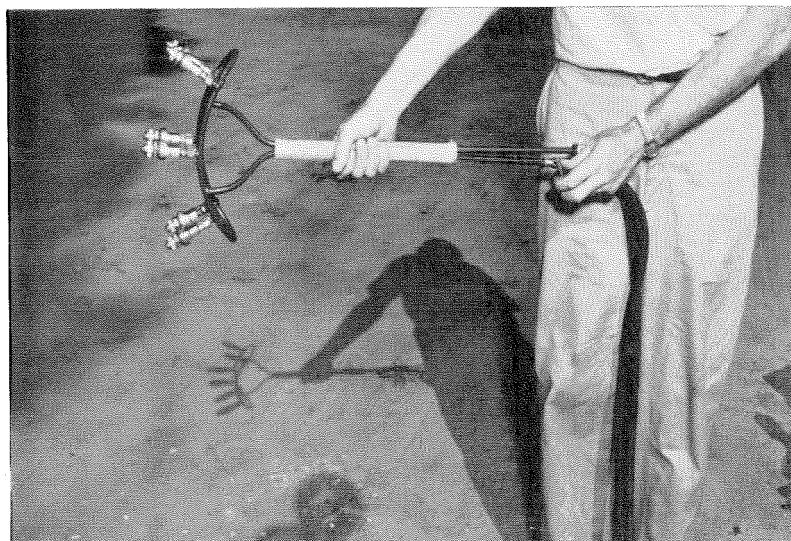


FIG. 2. Spray boom with valve for regulating liquid discharge.

LIST OF PARTS

Compressor Unit

- 1 1/4" nipple
- 1 1/4" tee
- 1 1/4" x 3/8" brass hose coupling
- 1 3/16" x 3" brass rod (belt guide)
- 1 3/8" street elbow
- 1 3/8" hose clamp
- 3 3/8" elbows
- 1 3/8" x 2" nipple
- 2 3/8" close nipples
- 1 1 1/2" angle iron, 1/8" thick and 9" long
- 1 1/8" x 4" x 7 3/4" iron plate
- 1 1/8" iron plate, 5" long, 4" on one end, 4 1/2" on other end
- 1 4" heavy duty strap hinge
- 1 3/8" (i.d.) 2-ply oil-resistant air-line hose, 10' long
- 1 3 1/2" A-section V-pulley, 9/16" bore
- 1 5" V-type A-section pulley, welded on cut-out to fit 3 1/2" standard jeep generator pulley
- 1 28" V-type A-section belt
- 1 6' flexible control cable (lock type) handle
- 4 5/16" x 1" bolts and nuts
- 1 Tension spring, 3/16" wire x 3" length x 3/4" width
- 1 Cable support clamp—3" x 1 1/2" x 1/16"

Tank

- 2 1/4" (i.d.) threaded sleeve, welded in tank
- 1 1/8" x 18" standpipe
- 2 0-30 pound gages
- 1 1/4" cross
- 1 1/4" tee
- 3 1/4" close nipples
- 3 1/4" x 3/8" hose couplings
- 3 3/8" hose clamps
- 1 1/4" regulating or bypass valve

- 1 5-gallon Army auxiliary gas tank
- 1 1/4" liquid strainer
- 1 1/4" x 1 1/2" nipple
- 1 1/4" elbow

Boom

- 1 1/8" x 19" pipe
- 1 1/8" x 22" pipe with 1/4" x 2" copper tubing welded in end
- 2 3/8" hose clamps
- 1 1/8" x 1/8" female brass shut-off valve
- 1 1/8" x 3/8" male hose coupling
- 1 1/8" x 3/8" female hose coupling
- 2 3/8" (i.d.) 2-ply oil-resistant hose, 15 feet long
- 1 1/4" x 2 1/2" copper tubing
- 1 1/8" pipe coupling

Nozzle Head

- 2 1/4" copper tubing, 24" long
- 14 1/4" x 1/8" brass tubing F connections
- 6 Set-up No. 30 with fluid nozzle No. 40100, air nozzle No. 120-6-35-60
- 3 Set-up No. 29 with fluid nozzle No. 60100, air nozzle No. 140-6-52-70

The compressor unit used at the Or- Benton Harbor, Mich. Other units of
lando laboratory was the vane-type No. similar construction may also be suit-
1065-Pr8, manufactured by the Gast Co., able.

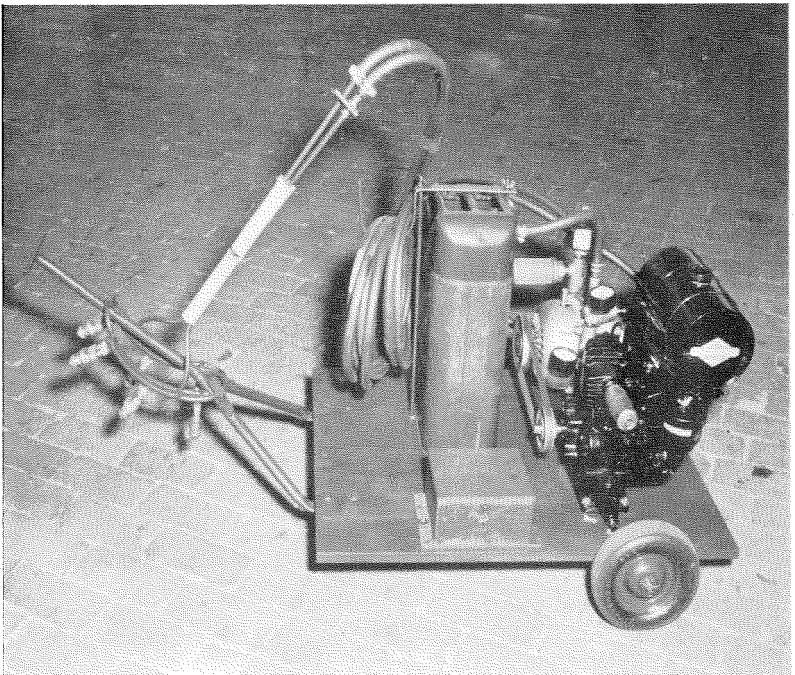


FIG. 3. Complete unit on mobile platform.